European Commission

ISSN 1024-0802

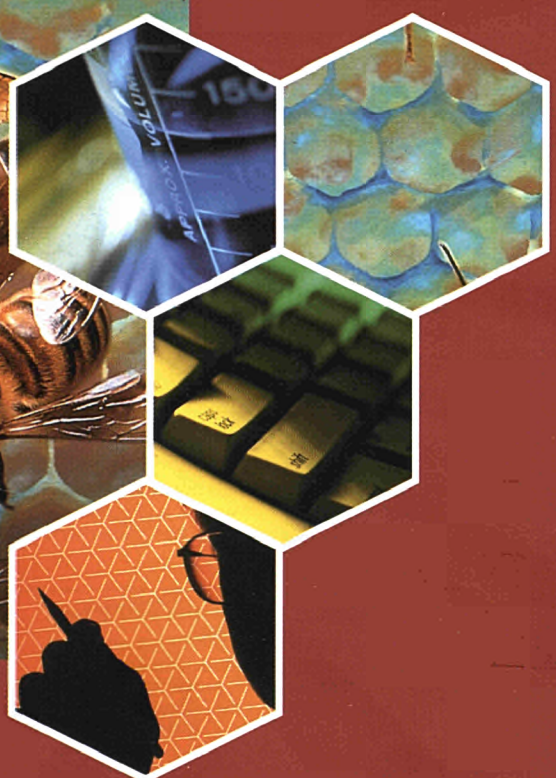
RTD info 24

Magazine for European research

November 99

Small and medium-sized enterprises

The busy bees of research



Management of natural risks

Defence against the white fury

Animal experimentation

Science without guinea pigs

FIFTH FRAMEWORK PROGRAMME

RTD *info* 24

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RTD Info is a magazine on research and technological development supported by the European Union. It covers general aspects of Community research such as project results and research policy, as well as practical information including dates of calls for proposals, events, conferences, publications, and so on. *RTD Info* is aimed not only at current and potential participants in Community research programmes, but also at a wider public of industrialists, decision-makers, students, and others who are interested in developments in European research. Published quarterly, *RTD Info* is available in English, French and German. Subscription is free. To subscribe, fill in the form below.

RTD Info is also available on-line on the European Commission's EUROPA server at:
europa.eu.int/comm/dg12/rtdinfo.html

Editorial Information

RTD Info is published by the Communication Unit of the Research DG.
Head of Unit: Jürgen Rosenbaum
RTD Info is produced by Michel Claessens (coordination), Stephen Gosden, Piia Huusela and Jutta Kastner. For any questions concerning RTD info, please contact the team at:
Tel.: +32-2-295.99.71
Fax: +32-2-295.82.20
E-mail: rtd-info@cec.eu.int *(NB: new address)*

For general questions about the Research DG's activities and the European Union's research programmes, please contact the Communication Unit:
Fax: + 32-2-295.82.20
E-mail: research@cec.eu.int *(NB: new address)*

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A European Research Area

Research is a natural expression of human curiosity, but it is also a vital element in the functioning of our societies and for the competitiveness of modern economies.

Research is a crucial policy area and I was enthusiastic when President Prodi proposed that I take on the research portfolio in the new Commission. This is only partly due to my early background as a lecturer in physics. It is much more related to the many scientific and societal challenges we will be facing over the years to come where research - in particular research carried out at a European level - can make a real difference.

Research in Europe has huge potential. Our universities, research centres and industrial laboratories have excellent facilities and perform work of the highest standard. European researchers and research teams are unequalled in the originality and creativity of their thinking - not least because of the diversity and essential complementarity of their differing research "cultures".

If we want to build on these assets and achievements we need to continue, reinforce and broaden our joint efforts. In doing so, the Framework Programme is - and will remain - the cornerstone of our policies.

However, the creation of a genuine "European research area" requires more than just the organisation of transnational co-operation in joint research projects and spending the Framework Programme budget, valuable though it is, as a sort of "seed money".

A "European research area" will only become a reality if we make every effort in a number of specific sectors. Let me give a few examples.

- We need to move towards real complementarity of research policies and programmes at all levels, with the objective of avoiding overlap and promoting cross-fertilisation of initiatives and approaches.
- We need to highlight and reinforce the essential contribution of research to other EU policies, be it in the field of the environment, food safety, regional development, or transport and, more generally, to provide the scientific expertise which is increasingly needed in practically all policy areas.
- We need to find better solutions to problems related to the use of research results, patenting, intellectual property and associated issues.
- We need to address the issue of the role of science and scientists in our societies, including the problem of their perception by the citizen. This will have to include efforts to increase not only the interest of young people in science but also their enthusiasm for careers in science.

Such initiatives - and I repeat that these are just a few examples - if they are to succeed, will demand the expertise and commitment of many. I intend, therefore, to consult as widely as possible with the scientific community, industry, users, the European Parliament and the Member States .

Similarly, we must plan extensive public discussion and the building of a general consensus on the future of European research as we prepare for the Sixth Framework Programme, which must follow the Fifth without interruption.

In short: there are many new challenges but we also have our day-to-day work. There are many exciting projects resulting from the first call for proposals under the Fifth Framework Programme. At the same time, some 12 000 projects under the Fourth Framework Programme are still in progress and need to be closely followed by the Commission. In doing so, we must not forget continually to improve the way we manage these programmes.

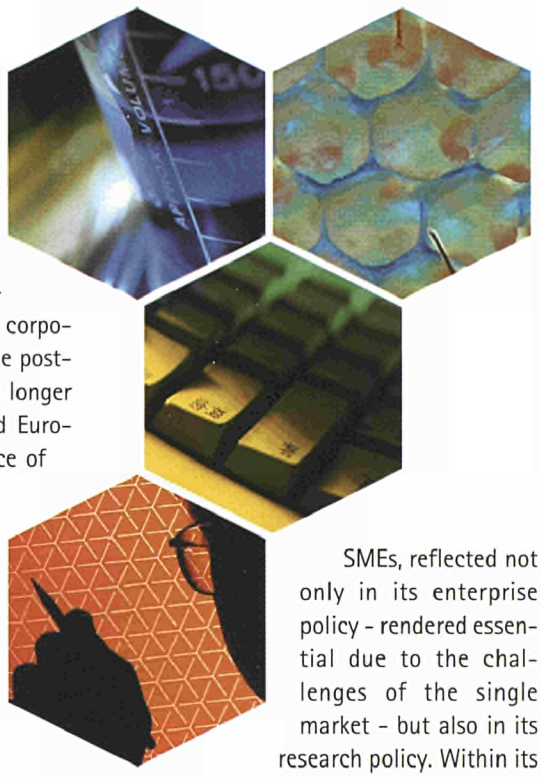
All in all, I do not see an easy time in front of me. It will, in fact, be a time of hard work both for me and for all my staff, work which I intend to be both visionary and pragmatic.

For our work to succeed I will need the support of all those who believe in the potential of European research and who are prepared to join our efforts to make the European research area a reality. I am sure I can count on that support - just as you can count on mine.

Philippe Busquin
Commissioner for Research

The busy bees of research

Small is beautiful (again). Launched in the 1960s, this somewhat utopian slogan was a protest aimed at giant conglomerates. Yet it contains an economic truth - the vital role of small and medium-sized enterprises (SMEs) - which, far from going out of fashion, 30 years later has become a leitmotif and a major concern for politicians, and a fact that also applies to Europe's scientific and technological development.



The importance of SMEs was confirmed in the late eighties and early nineties, in the face of the gathering pace of technological innovation and the inevitable globalisation of the economy. It was then that we discovered that the development of major corporations - the uncontested stars of the post-war decades of prosperity - was no longer able to ensure full employment and European competitiveness. The resurgence of entrepreneurship highlighted the vital role of SMEs in ensuring that economic and social progress and job creation penetrate all areas of society. Like busy bees, they function both as the *workers* essential to the prosperity of the economic hive and as the vital *pollinators* of technologies.

As the European Union has developed, it has come to realise the importance of SMEs, reflected not only in its enterprise policy - rendered essential due to the challenges of the single market - but also in its research policy. Within its science and technology programmes, the EU has adopted two approaches in seeking to involve SMEs: encouraging them to participate in as many research projects as possible, and promoting conditions under which innovation can flourish.

The "technology stimulation" and other support measures designed specifically to help SMEs get involved in research were largely developed during the five years of the Fourth Framework Programme, and succeeded in tripling the participation of small and medium-sized enterprises in the years 1994-1998 compared with 1991-1994.

This priority remains under the Fifth Framework Programme. Measures to promote the participation of SMEs are found throughout the Union's research activities while the Innovation and Participation of SMEs programme is responsible for supporting and coordinating with the thematic programmes. It is this active strategy which is presented in the course of the following pages. ■

"Bright sparks" fly upwards

Some 14 750 SMEs participated in European research projects between 1994 and 1998 - three times as many as under the Third Framework Programme (1990-1994).

Around 50 000 partners have participated in European research programmes over the last five years. Almost one in three of these were small or medium-sized enterprises, which represented 62% of industrial participation and received 21% of all Community financing. "These proportions are very encouraging and significant," believes Hans-Werner Muller, Secretary-General of the European Association of SMEs (UEAPME). "Apart from the positive impact the European Commission has had on an active minority of small businesses, such figures have a psychological value in terms of closer identification. It should be remembered that, in this vast world of small businesses, many still feel very distant from the Brussels machinery."

Three types of participation...

Approximately 7 900 participations - 55% of the total - involved SMEs as "normal" partners in traditional *collaborative research* projects open to other types of participant (large companies, research centres, university laboratories, etc.). These SMEs received European financing estimated at 1.1 billion euros. The favourite fields for SMEs were industrial technologies (30%), information technologies (16%), telematics applications (15%) and renewable energies (13%).

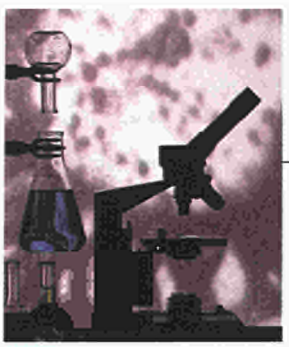
The remaining 7 000 participations formed two groups and were the specific result of technology stimulation measures initiated by the European Union.

- EU support for almost 700 *cooperative research* projects (CRAFT), within which trans-European groups of SMEs entrust the search for high-technology solutions to qualified external laboratories or research centres (see *Cooperating*, p. 11), provided 4 200 participants with funding of 270 million euros.
- The Commission also made approximately 1 250 *exploratory awards* to cross-border consortia of SMEs in order to allow them to prepare research proposals (see *Exploring*, p. 11). 50 million euros were distributed to 2 600 companies, the vast majority in industrial technologies (64% of recipient SMEs) and life sciences (18%). It should be noted that these awards are particularly effective in the case of cooperative research proposals: 45% of the CRAFT projects prepared with the help of this exploratory funding were subsequently selected.

...for both users and developers

A survey carried out among a wide range of SMEs involved in implementing the Fourth Framework Programme revealed two principal profiles.

Almost two-thirds are companies with some experience which turn to European research because of their high expectations as *users of advanced technologies* and, despite insufficient in-house research capabilities, want to participate in new developments in their speciality and to benefit from the results.



Biotechnologies: talented young SMEs join forces

The life sciences are a field where a whole new generation of SMEs is making its mark. Young companies, often with their origins in the academic world and retaining close links with the expertise of university laboratories, are spearheading extremely advanced European research with potentially innovative biomedical and biotechnological applications. One example is in the field of new cancer treatments. In 1997, Leadd BV (NL), working in close cooperation with the University of Leiden, and Genopoietic SARL (F), linked to the *Pierre et Marie Curie* University in Paris, obtained an exploratory award in order to study the possible results of pooling their respective know-how. The Dutch firm had developed a very specific anti-cancer drug, *Apoptin®*, which can trigger the genetically programmed death (apoptosis) of tumour cells - and in particular cells resistant to traditional chemotherapy. Meanwhile, the French SME was working on producing a powerful vector for genetic treatment, the *plasmavirus*, a recombination of plasmids and retro-viruses able to infect tumour cells through the expression of a foreign gene. After a few months, the exploratory study showed the benefits of a treatment in which *Apoptin®* is expressed using plasmaviruses. This led to the launch of a demonstration project, supported by the EU's Biotech programme, in which the initial partners invited Biotecnol to join them. Biotecnol is a pioneering SME in Portuguese biotechnology with highly developed expertise in the metabolic and genetic optimisation of plasmids on an industrial scale. The aim of this dynamic partnership is to prove the effectiveness and safety of this new treatment on animal models prior to starting clinical trials.

Demonstration of safety and efficacy of an anti-tumour therapy based on plasmoviruses expressing Apoptin® - Biotech - five partners from three countries (The Netherlands, France, Portugal).

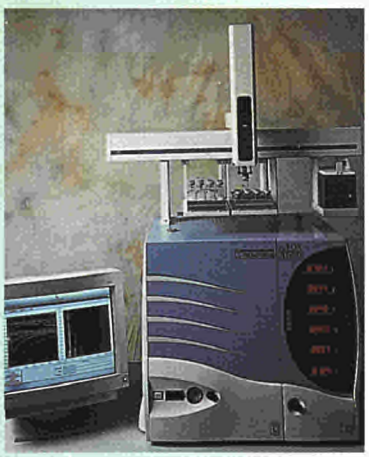
This profile, very common in projects linked to the manufacturing industries and services sector, is reinforced by the CRAFT system of cooperative research, especially designed to meet such needs. On a European scale, it is estimated that between 10% and 15% of industrial SMEs fall into this category.

The remaining third, on the other hand, can be seen as *technology developers*, often with their origins in universities or research centres. These small firms with a high scientific or technological bias are active in high-technology sectors and aim to become known by launching innovative products or services. To do so, they have no hesitation in joining forces with others in order to participate in cooperative projects within European research programmes. Companies with this profile are estimated to represent between 3% and 5% of European industrial SMEs. ■

Discerning sensors

"Participation in European projects allows an SME to increase its network of partners by pursuing a common innovation goal," points out Eric Chanie, director of Alpha MOS. This Toulouse-based company received EU support under the CRAFT programme in order to step up its research into the complex field of odour-measurement instruments. The first development of an 'electronic nose', comprising three types of specific sensors and a system of artificial intelligence, resulted in the FOX 2000 analyser. Tailored to the needs of each customer, the analyser can trace the story behind a smell, classify products, provide additional information on technical incidents and assess manufacturing processes on-line. In the agri-foodstuffs, chemical and cosmetic fields, for example, it can help assess the hormone levels in meat or the quality of oak barrels for wine.

Alpha MOS is now engaged in a new European project, Fregmegs, where eight partners from four countries will develop a new generation of multifunctional odour sensors capable of recognising complex molecule mixes. "European support makes it possible to mobilise the necessary resources and at the same time increase the know-how of each partner company," stresses the head of Alpha MOS, an SME which employs 40 people, exports 45% of its production to the United States, and owns three subsidiaries - in Germany, the United Kingdom and the USA.



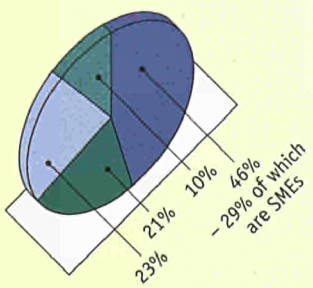
The Prometheus system, combining Kronos mass-spectrometry techniques and FOX sensors.

Odour Sensors in the Food Industry - Brite-EuRam - eight partners from four countries (France, Italy, Sweden, the Netherlands).

Fregmegs - Brite-EuRam - eight partners from four countries (United Kingdom, Germany, France, Switzerland).

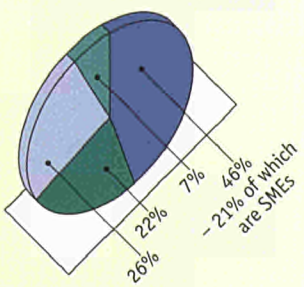
Fourth Framework Programme

Participation in projects supported by the Fourth Framework Programme



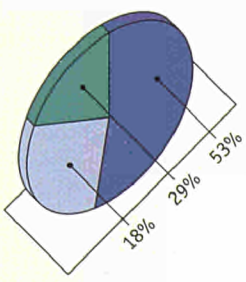
- Industry
- Research bodies
- Universities
- Others

Financing of projects supported by the Fourth Framework Programme



- Industry
- Research bodies
- Universities
- Others

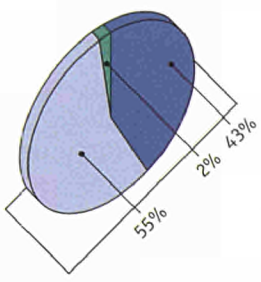
Participation of SMEs per type of project



- Collaborative research
- Cooperative research (CRAFT)
- Exploratory awards

Profile of SMEs involved

Collaborative research

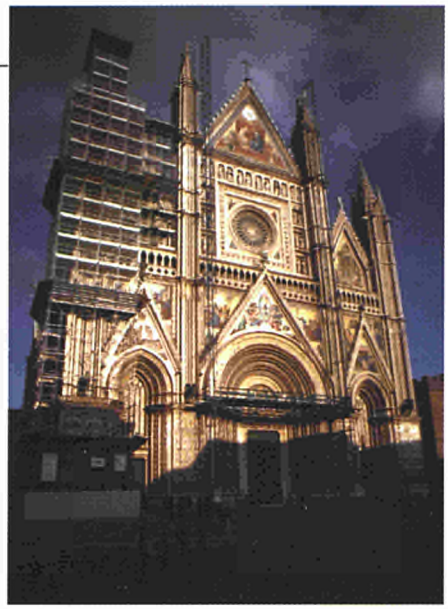


- Developing advanced technologies
- Using advanced technologies
- Consuming technology

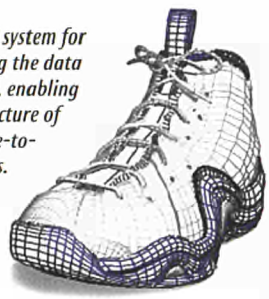
Lasers and cultural heritage

Ancient and fragile, frescoes and paintings on wood too often crack and crumble. But how can such damage be prevented and diagnoses made without adding to the problems? The answer lies in non-invasive instruments which are able to assess the condition without getting too close. The frescoes in Orvieto Cathedral (I) were checked in this way, using the new Doppler Vibrometry laser technology. This technology is able to detect delamination and cracking over large areas of frescoes remotely. It was developed by a British SME, Ometron, as part of a project under the EU's Standards, Measurements and Testing programme, coordinated by the University of Ancona (I). "This development represented the first application for us in this very specialised field," explains David Smith of Ometron. "We succeeded in modifying our systems in order to maximise their sensitivity to the most minuscule physical movements in works of art. The added value brought by our participation in the project allowed us to increase our expertise and extend the range of our equipment, make contacts throughout Europe and look at studying other technologies. This was invaluable as it allowed us to develop concepts that we would not otherwise have been able to explore."

Laserart - Standards, Measurements and Testing - five partners from four countries (France, Greece, Italy, United Kingdom).



Restoration of Orvieto Cathedral, Italy.



CAD-CAM system for modelling the data obtained by laser, enabling the manufacture of genuinely 'made-to-measure' shoes.

Digital orthopaedics

Like *haute couture*, orthopaedics is a made-to-measure art, with repeated fittings and alterations in order to obtain shoes which combine practicality, comfort and aesthetics. But being "handmade" comes at a price, in terms of the time taken and the costs incurred (even if these are partly covered by social security).

Four SMEs which manufacture orthopaedic shoes and a high-technology company decided to join forces to give a technological boost to this painstaking skill in a completely new approach. They designed a CAD-CAM system to model data obtained remotely using of a laser sensor, and thereby recreate the shape of the foot in three dimensions. This model then provides the necessary information for the machine which produces the perfectly custom-made orthopaedic shoe.

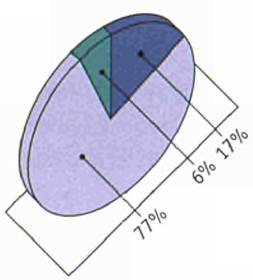
"Without the support of CRAFT, this project would never have got off the ground. The cost of the prototype alone - a million euros - is unthinkable for craft businesses," explains François Venel, coordinator of the project which is today taking shape through Dilaco, a new company set up specifically to develop industrial versions of the system and market it from 2001.

"This system also opens up opportunities in the field of the larger-scale production of 'comfort' shoes which involves a 'made-to-measure' approach without falling within the medical field," points out François Venel. "This EU-funded project combined various technical and commercial approaches which were both different and complementary. It illustrated that the know-how required for producing a shoe had almost totally disappeared from Europe's traditional footwear production, with only orthopaedists still possessing the technical expertise. This specialist knowledge has now been incorporated in a new technology which could represent a major added value for traditional shoe manufacturers."

Dilaco - Brite-EuRam/CRAFT - five partners from four countries (France, Belgium, Germany, Italy).

in European projects

Cooperative research



Incentives in action

Hendrik Tent

The Fifth Framework Programme for European Research and Technological Development (RTD) gives the participation of SMEs a higher profile and increased support. Hendrik Tent, deputy director-general of the Research DG and one of the architects of this strategic change, spoke to RTD info about the implications.

> "Specific measures for SMEs now cut across all thematic fields."

European SMEs represent a complex and heterogeneous network of almost 18 million companies. Under the Fourth Framework Programme, European research policy succeeded in "catching" more than 14 500 of them, providing them with EU funding in order to participate in RTD projects or initiate their own projects. In absolute terms, the figure is high and reflects evident progress, but in relative terms it can seem to be just a drop in the ocean. How should we view the significance of Community support at this level?

Hendrik Tent: You must be careful how you present such figures. For the vast majority of SMEs the essential need is for new technologies to be incorporated in their activities, and not for them to be directly involved in research work. I am suspicious of a science and technology policy concerned solely with levels of participation and not qualitative objectives. Our role is not to hand out subsidies to industrial companies, but to support projects involving partners of all sizes from all countries with a view to improving Europe's industrial competitiveness.

The realities of diversity

In the research field, there is a need to take a rather closer look at the reality behind these three very fashionable letters: SME. A company employing 250 people in the textile sector is a small business. A company of the same size in the computer software sector is already a business of some size that could almost be described as a large company. There are also high-growth sectors at the moment, such as biotechnologies, where the explosion in high-tech SMEs is a genuine engine for growth and jobs.

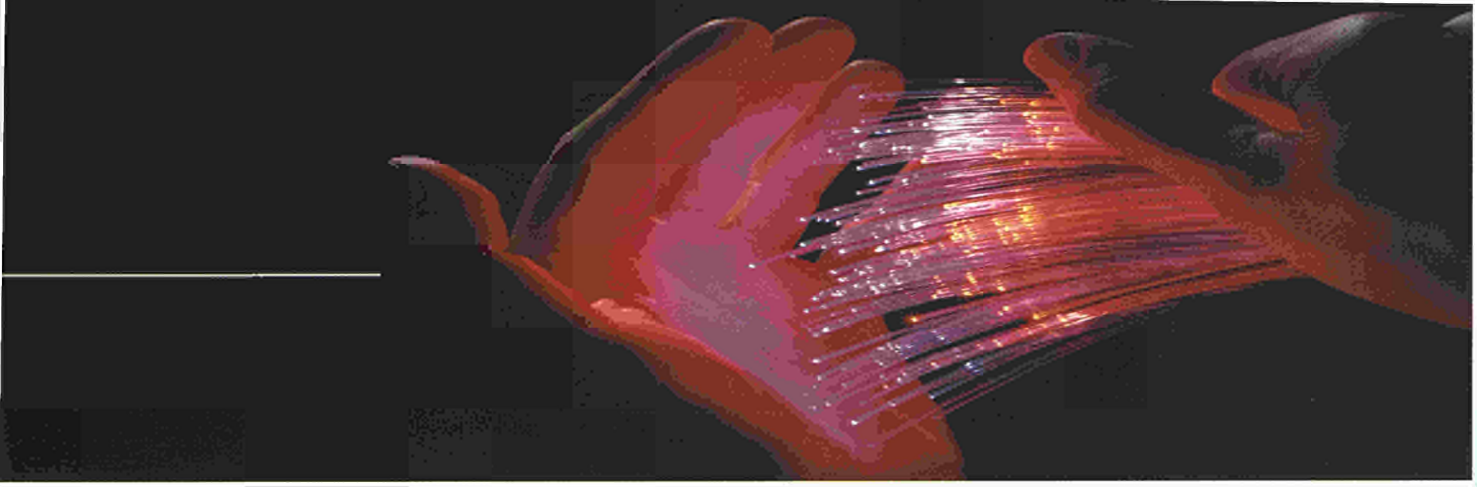
Apart from everything else, SMEs are playing an increasingly important role in the vast majority of industrial sectors for the simple reason that large companies are progressively 'slimming down' in the interests of efficiency and delegating a large part of their technological activities. At the same time, the most dynamic SMEs which seize this opportunity are having to invest more in technological R&D in order to meet the quality and complexity demands of their customers.

But subcontracting is just one aspect. If we want the most dynamic SMEs to develop, we must help them stand up to an increasingly keen technological competition stimulated by the single market and globalisation. They can no longer be content with local horizons but must constantly innovate and create new markets.

Research by and for SMEs

What important lessons can we learn today from the participation results for SMEs in the Fourth Framework Programme?

We can identify two clear trends. On the one hand, simply as a result of being effectively informed, SMEs are now very actively involved in *normal* collaborative research projects where they are on an equal footing with the other players in the field of science and technology. Almost half the participation of industrial companies occurred *regardless* of special measures as a result of the efforts of dynamic and innovative small firms which already possess high-level research capabilities. The reasons such companies, which we refer to as *technology developing* SMEs, are attracted are quite clear. By participating in the wide diversity of research projects supported by the programmes they gain access both to the other partners' collective knowledge and to all



the results. This is a very important aspect and, financially, the calculation is very attractive. If an SME manages to commercially exploit a new development coming from a project which, for example, involved five partners over three years at a cost of 2 million euros (with Commission financing of 50%), its *admission ticket* as participant will have been just under 67 000 euros per year. This reduction in cost - and thus in the often excessive risk which places research beyond the reach of SMEs - is a powerful lever. In addition, for a small company, the doors which trans-European cooperation can open up are another important aspect.

But the most significant experience acquired during the Fourth Framework Programme was in implementing the successful and much-celebrated *technology stimulation measures*, i.e. the *cooperative research* approach, or CRAFT, and the complementary *exploratory awards*. The objective is to support technological developments *whose use by groups of dynamic, European SMEs* is likely to be fruitful, even if they lack both sufficient research capabilities to carry out the work themselves and the necessary knowledge of companies in other countries with the same problem. It is therefore a question of supporting research done by others, *for* these SMEs. When this idea was launched, about six years ago, nobody knew what this initiative would produce by way of result and I personally was, if not sceptical, then at least aware that this type of support needed to be tested carefully. This is what we started doing, but my doubts soon disappeared. The SMEs submitted many interesting proposals and, by the end of the Fourth Framework Programme, almost 700 CRAFT projects involving 4 200 participations had been selected. For most companies this was their first experience of research.

The new with the tried-and-tested

If the stimulation measures in force have been continued, what specifically has then changed for SMEs under the new framework programme?

First of all, the scale and mobilisation of the available resources. Whereas, so far, efforts in favour of SMEs have been something of a separate chapter tacked on to research policy strategy, specific measures for SMEs now cut across all thematic fields. The European Union is clearly making this a pillar of its research policy, reflected in all the programmes. In addition, at the request of the European Parliament at least 10% of the budget of each thematic programme has been reserved for SMEs.

This presents a challenge not only for the Commission's services but also for the SMEs themselves which must now come up with proposals. In this context, the new 100% 'bottom-up' approach by CRAFT offers very wide-ranging possibilities. Thus a proposal for a CRAFT project can be submitted at any time provided it is in line with the general objectives of a thematic research programme. The selection criteria will not of course be compromised in order to reach the budget. The money spent to support projects always depends on the number and quality of proposals submitted.

There are three other specific changes which are essential to the success of this policy. The first concerns administrative simplification, a frequent subject of discussion - and rightly so. There is now a *single helpdesk* at the Commission which is fully operational and responsible for managing all contacts with SMEs, with rapid response times.(1) The submission of proposals has also been considerably simplified.

Secondly, there is proximity. It is not possible to conduct a dialogue with SMEs from Brussels. We have strengthened and revitalised the network of national contact points working in the immediate vicinity of the companies. The role of this network has become all the more important as potential participants are no longer limited to EU Member States alone, but now include the 11 applicant countries and five other countries - Norway, Iceland, Israel, Liechtenstein and Switzerland.

Finally, there is the matter of providing SMEs with timely scientific and technological information. There is a major need for this, and it is particularly important to do it at a European level. That is the reason for the new *Economic and Technological Intelligence* action which the Commission has launched and will be developing during the framework programme. ■

(1) More information about this helpdesk can be found on p.14.

The Fifth Framework Programme's new strengths

The nature of the three major avenues of support for the participation of SMEs in European research projects - exploratory awards, CRAFT cooperative research, and collaborative participation in traditional projects under the thematic programmes - has not been radically changed under the Fifth Framework Programme, but a number of modifications to the project selection procedures and the new information sources for companies are helping to boost their quality and effectiveness.

First of all, what is a small or medium-sized enterprise? In this respect, there is a significant change. The Fifth Framework Programme applies a new ceiling: an SME is now defined as a business with fewer than 250 employees, rather than 500 as before.(1) This change brings research policy into line with other Community policies which have been using this definition since 1996. "SMEs with more than 250 employees - which will now be classed as large companies - represented just 5% of the partners in the CRAFT projects," explains Robert-Jan Smits, head of the European Commission's SME and Innovation Unit. More than two-thirds of the SMEs which participated in collaborative or cooperative research under the Fourth Framework Programme had fewer than 50 employees. Small firms therefore show a marked interest in European support and are gaining access to it in increasing numbers. "The new definition is therefore adjusting correctly to the facts. I would also add that, for 75% of the SMEs that benefited from technology stimulation measures, this was their first experience of transnational research."

(1) Two other criteria must be met in addition to size: either the annual turnover must not exceed 40 million euros or the annual balance-sheet total must not exceed 27 million euros; no more than 25% of an SME may be controlled by an organisation that is not itself an SME (unless it is a financial investor).

From fundamental physics to medical application

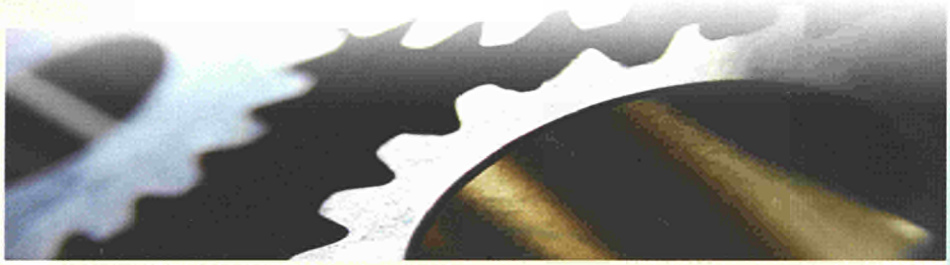
Injection of slightly radioactive products has long been used to visualise certain organs or in the search for tumour metastases. A new particle detection method, developed by French Nobel prize-winner, Georges Charpak, is today bringing a radical change of approach. It was an SME, Biospace Instruments (F), which managed to 'transfer' this discovery from the field of high-energy physics to that of scientific and medical instrumentation. As the coordinator of an EU-backed project, Biospace teamed up with Italian and British partners to develop a fully automatic system of autoradiography. The first such devices have already been installed in a number of European hospitals. By detecting the particles one by one, this innovative instrumentation provides high-precision cross-section images of organs, in real time, thereby permitting much lower and better-targeted radiation doses.

Kinematic view of the movement of the heart wall.

"In the case of chemotherapy treatment of cancers, our detectors - which are also less cumbersome than traditional nuclear-imaging devices - enable the treatment to be adapted and refined for each individual patient. In heart surgery, they make it possible to visualise the result of an open heart operation before closing the thorax again. In brain surgery, having an image of the tumour throughout the operation should permit a more precise ablation," explains Claude Hennion, director of the SME he founded with Georges Charpak.

Outside the field of nuclear medicine, the system developed by Biospace can also be adapted to traditional radiography, with the advantage of reducing the irradiation on each examination by a factor of 20 or 30. This benefit is all the more important in the light of the international regulations governing the quantity of X-rays patients can receive, in particular during screening. There is therefore a huge market for the technology developed by Biospace - a high technology SME which already has more than a dozen international patents.

Development of a detector for ultra-low radioactivity measurements in biological and medical fields such as cardiac imaging - CRAFT Standards, Measurements and Testing - six partners from three countries (France, Italy, United Kingdom).



Exploring

For the large majority of SMEs the decision to participate in a European RTD project can be a very difficult step to take. The costs of leading - or even being a partner in - a collaborative or cooperative research proposal are often considerable in terms of both human and financial resources. It means identifying those areas of innovation which are vital for the company, checking feasibility, finding cross-border partners, preparing the files to be submitted to the Commission, and so on.

This is why the Commission offers interested SMEs the possibility of an exploratory award which can be used to meet the costs of preparing proposals for research and/or demonstration projects, cooperative research (CRAFT) or innovation projects.

The new system of exploratory awards is subject to the following conditions:

- the proposal must be submitted by at least two SMEs from different countries, which must justify the importance of the role they intend to play in the project proposal;
- the total budget for this preparatory phase - lasting a maximum of one year - must not exceed 30 000 euros;
- the award will be 75% of the amount requested (the ceiling is therefore 22 500 euros).

Cooperating

The CRAFT (Cooperative Research Action For Technology) system of cooperative research projects is designed to allow trans-European consortia of SMEs with inadequate research resources to entrust their R&D activities to external organisations. The research must relate to the development of their activities in the fields covered by the Fifth Framework Programme's thematic programmes. Treated as project leaders, the participating SMEs are represented by one SME which takes on the role of coordinator, the coordination costs being met by Community financing.

Three important rules apply.

- At least three, mutually independent SMEs from at least two different countries must participate in the project.
- The RTD activities must be entrusted to research organisations, which are paid in full for their services. These organisations are required to be independent of the participating SMEs.
- EU support cannot exceed 50% of the total eligible costs, with a ceiling of 2 million euros. The participating SMEs must make up the balance.

Collaborating

SMEs are welcome as full partners on the same footing as other participants in all research and demonstration projects funded by the thematic research programmes, as well as the programmes for international cooperation and the promotion of innovation. And it should be remembered that if at least two SMEs from different countries are to play a significant role in the project, participation can be prepared with the help of an exploratory award as described above.

Batch evaluation dates

Under the open call for exploratory awards and CRAFT projects, evaluation sessions have already been held on 14 April and 15 September 1999. Future dates for the batch evaluation of proposals are as follows:

- for **exploratory awards**, 12.01.2000 - 26.04.2000 - 13.09.2000 - 17.01.2001 - 18.04.2001
- for **cooperative research**, 12.01.2000 - 26.04.2000 - 13.09.2000 - 17.01.2001 - 18.04.2001 - 18.09.2001 - 16.01.2002 - 17.04.2002

The closing dates for collaborative research depend on the specific calls launched by the relevant thematic programmes (see table pp. 18-19).

Secure storage for a sensitive product

The public health problem which led to the stoppage of certain Coca-Cola lines last summer has highlighted the question of products possibly being contaminated by wooden storage pallets. Used in all industrial sectors - from pharmacy to construction - these pallets cannot be allowed to contaminate the products they carry. In particular, it is important for the drying procedures which guarantee the minimum humidity levels of the wood used in manufacture to meet users' requirements by eliminating any risk of contaminating mould. Eighteen European partners, including 15 SMEs from the wood and handling sector, joined forces on the Palsec cooperative research project. Their aim was to achieve a much more rigorous identification of requirements and procedures for wood-drying quality control, in line with the specific needs of sectors as different as chemicals, plaster and cements, agri-foodstuffs and the paper industry. The research - entrusted to French and Portuguese technical centres as well as an Italian drying-oven manufacturer - made it possible to draw up much more precise standards at the European level and to develop a software program to determine drying times and related costs, as well as new continuous-drying processes better suited to pallet processing.

Palsec - Brite-EuRam - 18 partners from 8 countries (France, Portugal, Italy, Spain, United Kingdom, Belgium, Germany, Ireland).

Drying pallets - François, Virton (B).

Increased funding

There are two main categories of increased financing for SMEs.

- At the European Parliament's express request, an indicative 10% of the total funding for research projects *within the thematic programmes* has been reserved for SMEs (including CRAFT and exploratory awards). This represents a budget of almost 1100 million euros. "This objective is a clear signal of the importance the European Union attributes to SMEs in its research policy. What is more, there is nothing to say that it cannot go beyond this level," underlines Robert-Jan Smits.
- *The budget for the Innovation and SMEs programme* has increased from 293 million euros in the period 1994-1998 to 363 million euros under the Fifth Framework Programme. Of this amount, apart from actions devoted specifically to promoting innovation, 44 million euros is allocated to coordinating SME specific measures and support actions to increase the participation of SMEs in research projects in the thematic programmes.

Simplified and accelerated procedures

SME specific measures are not dependent upon other calls for proposals which are targeted and limited in time. They are the subject of an open call launched on 1 April 1999 and all eligible proposals are evalu-

ated on a batch basis at regular dates. Provided they meet the general objectives of the various programmes, the choice of research subjects is based on a bottom-up approach. "We know that SMEs do not think in terms of programmes and we want their proposals to correspond to concrete development opportunities of direct concern to them." While respecting the essential principles of a quality-based selection of proposals, the formal procedures (eligibility conditions application forms, etc.) have been considerably simplified and the evaluation criteria clarified and harmonised.

The Commission has also undertaken to reply to all applications within the 13 weeks following the scheduled batch evaluation dates. The terms of the contract, payment procedures and regulations regarding the evaluation of results have also been redefined.

A single helpdesk

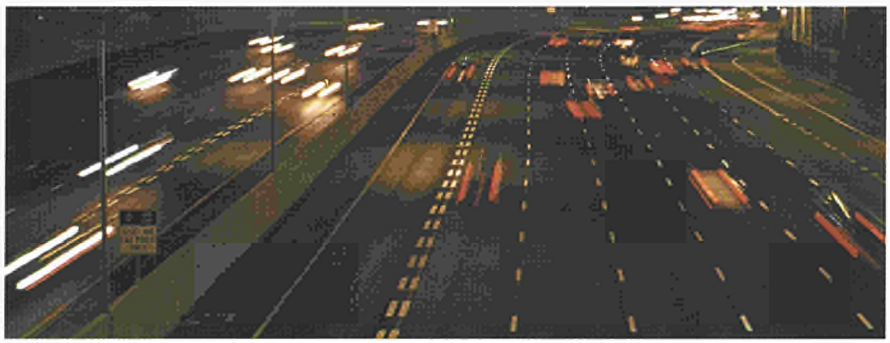
A telephone number (and answering machine outside working hours), a fax, an e-mail, and a web site: the SME helpdesk - a service widely called for by companies - has been operational since April 1999, providing a single contact point for SMEs seeking information or assistance from the Commission's Research Directorate-General. It provides information on participation in research activities, in particular on stimulation measures. It also redirects questions on matters outside its field (promotion of innovation, legislative aspects, intellectual property, etc.) to the other parts of the Commission dealing with these.

Between April and September 1999, the new SME helpdesk received approximately 2 250 requests for information, many of them multiple questions to which it provided an initial response within 24 hours. The most frequently asked questions relate to call procedures, contractual matters and the search for partners. A sign of the times, two SMEs in three use electronic mail and one in three have their own Internet site.

"Sustainable" towns

How is it possible to design "sustainable" urban-development policies in Europe? What kind of models enable the often-conflicting economic, environmental and social interests to be taken into account? More specifically, how can the demands of both transport and town planning be met? These questions, for which answers are urgently required by urban decision-makers, are the subject of applied socio-economic research, notably within the growing number of SMEs offering consultancy in defining long-term policy tools. Example: the pilot research project coordinated by the Finnish SME, LT, which analysed three very different urban neighbourhoods: the north of Helsinki (FI), the town of Naples (I) and the industrial suburbs of Bilbao (E). Representatives of the local, regional and national authorities were all closely involved in this work, in particular in order to define exactly what they expected from such a tool. The effects - both positive and negative - of urban development were described and evaluated for these three sites by means of indicators relating to the environment, social factors, transport, the economy and town planning. A comparative analysis of the various situations resulted in an operational decision-making model designed for urban development policy-makers.

Spartacus - Environment - five partners from five countries (Finland, Spain, Germany, Italy, United Kingdom).



Meeting the demands of transport and town planning.

Opening up to SMEs outside the EU

Under the Fifth Framework Programme, the European research area has been enlarged to include 10 Central and Eastern European countries - plus Cyprus - all of which are applicants for European Union membership. "This new possibility of benefiting from European support by participating in projects in all thematic fields will prove vital for our SMEs which are seeking to develop their technological capacities," believes Janis Stabulnieks, director of the Latvian Technology Centre (LTC), a technological assistance company appointed to serve as national contact point in Latvia. "At our level, we find the opportunities opened up by the exploratory awards to be particularly useful - we have already submitted a dozen applications for participation since April 1999. Our companies do not have any experience in trans-European cooperation and this mechanism allows them to obtain the vital support they need in order to prepare projects."

On the other hand, being able to deal with independent bodies such as the LTC - appointed by the European Union and the Latvian government to encourage and help the most suitable companies and research centres to participate - is of major benefit to partners in the EU Member States who want to develop their scientific and technological links with this region.

SME National Contact Points

Tested during the Fourth Framework Programme, the new network of National Contact Points (NCPs) has already become an essential structure. It places the Research Directorate-General in close contact with local, regional and national SMEs. Working in liaison with the Commission, the SME NCPs are independent decentralised helpdesks located in the Member States, applicant countries and other partner countries which are full participants in the Union's research policy. In the interests of reinforcing the participation of SMEs in European projects, the SME NCPs fulfil the four-fold task of increasing awareness, providing information, offering assistance and mutual cooperation.

Economic and technological intelligence

Knowledge of emerging trends on the technologies market is of major benefit to the development of SMEs. This was the reason for launching a specific initiative called Economic and Technological Intelligence (ETI) which invites proposals from all the European networks representing SMEs, including transnational networks of industrial federations, regional development agencies for promoting innovation, etc. The aim is two-fold:

- to set up information and analysis services drawing on all the available data at various levels in order to identify the needs of SMEs and market trends;
- to highlight the possible responses to these needs and trends through participation in EU RTD programmes and other Community initiatives.

The ETI tools eligible for support include the organisation of transnational industrial and technological *brokerage* events (bringing together SMEs, suppliers, users, large firms which use subcontractors, venture capitalists, etc.), and workshops for training and the exchange of best practice on old technology activities and the management of the exploitation of project results. ■

Dynamic NCPs: the British example

More small and medium-sized enterprises from the United Kingdom participated in European technology stimulation measures for SMEs under the Fourth Framework Programme than from any other country. "Between 1994 and 1998, 29% of European SMEs receiving exploratory awards and 23% of those participating in CRAFT projects were British," points out Bob Keown, director of BETA Technology Ltd, an independent SME providing technological consultancy and, since 1992, government-appointed National Contact Point (NCP). "The success rate for proposals including UK companies was very high - almost 50%."

These results are the fruit of the strategy of one SME which set out to help the rest, listening carefully to their needs. BETA Technology is a dynamic firm with 20 employees, two-thirds of whom are experts in specific sectors from a wide range of high technology industries - from biotechnologies to manufacturing activities, including agri-foodstuffs. Its approach was three-fold: it provided information on Community support for SMEs throughout the country, assistance in preparing projects, and links with the network of other British organisations providing help for companies in connection with research. "About 370 exploratory awards and 200 CRAFT projects were initiated by British SMEs. As a result, we also worked closely with other European NCPs in order to find perfectly complementary partners, in particular in Germany, France, Ireland, Greece and Spain," added Mr Keown.

Contact SME Helpdesk
Tel. +32-2 295 7175
Fax +32-2 295 7110
research-sme@cec.eu.int
www.cordis.lu/sme

National Contact Points
www.cordis.lu/sme/src/sme-ncps.htm

Models for surgeons to practise on

Cranial model. The colouring, produced by means of stereolithography, makes it possible to identify bone tumours.

An exact 3D replica of the part of the body on which they are going to operate is now available to surgeons thanks to a new technology developed by the Phidias project,[1] in which the major partner was a Belgian SME, Materialise, which specialises in the industrial technologies of rapid prototyping. Working on the basis of data obtained by scanning the part of the body to be operated on, a computer-controlled laser 'sculpts' a reproduction using a special kind of resin, producing a coloured finish which makes it possible to distinguish between the various tissues (bones, cartillage, etc.) and to identify the damaged parts, such as tumours. Ready in 24 hours, these models allow surgeons to visualise the operation they are preparing for and to work with utmost precision. Since 1996, Materialise has sold about 20 licences worldwide and opened a sales division in the United States. "Our technology is particularly appreciated by maxillofacial surgeons, and 90% of prototypes are models of the cranium," explains Kris Wouters, medical applications engineer at Materialise. In order to guarantee the quality of the technology and to increase its applications, the Phidias project has set up a vast European thematic network coordinated by the Belgian SME. Thanks to the Commission's financial support, this network brings together 40 high-level technological and medical institutions. "What is more, a validation study carried out among 700 surgeons in Europe is being coordinated by the German social security organisation MDK. This should permit a much wider dissemination of a process that is still very new in the medical world. In addition, we are also developing possibilities for manufacturing implants and the tools for fitting them within a new European project named PISA (Personalised Implants and Surgical Aids)."
Founded in 1990 by two researchers at the University of Leuven, Materialise today employs about 100 people. According to Kris Wouters, "Such growth owes a lot to support from Europe."

Phidias - Brite-EuRam - five partners in three countries (Belgium, Germany, United Kingdom).
Phidias thematic network: 40 partners in 11 countries.
PISA - Brite-EuRam - six partners in three countries (Belgium, the Netherlands, United Kingdom).

Innovation: a growing priority

The participation of SMEs in European projects only has meaning if they are then able to exploit the results. In addition to scientific and technological capabilities, the promotion of an innovation culture - the ability to convert research results into products, processes or services - is a constant theme running through all the RTD programmes the EU supports.
When selecting projects the proposals are judged not only in terms of the quality of their scientific and technological objectives, but also on the attention paid by the partners to how they are going to capitalise on the results in practice including commercial development.
In addition to the support given to SME participation, the role of the Innovation and SMEs programme is to support and coordinate the "innovation cells" set up under each thematic programme. Their purpose is to help maximise the dissemination of results to established structures and networks throughout Europe (in particular via CORDIS, the on-line service for Community research, and the 200 or so Innovation Relay Centres (IRCs) supported by the Commission to help SMEs gain access to new technologies), to seek market opportunities and find partners.
Two other new initiatives of the Innovation and SMEs programme must also be mentioned:
• the creation of the IPR Helpdesk - a multilingual, on-line helpdesk specialising in helping SMEs with problems of rights to intellectual ownership and patents;
• the launch of the LIFT (Linking Innovation, Finance and Technology) service, which assists companies in their dealings with financing networks for investments in technologies - venture capital, business angels, institutional investors, banks, etc.
Finally, through the 'Innovation projects', the programme supports experiments with new practical approaches to promoting innovation.

(1) All aspects of innovation policy are covered by ITT magazine (Innovation & Technology Transfer), published every two months in five languages, accessible on-line or free on subscription: www.cordis.lu/itt

Contact Innovation Helpdesk
Tel. +352 4301 33161
Fax. +352 4301 32084
innovation@cec.eu.int
www.cordis.lu/innovation-smes

News in brief

New names and e-mail addresses

The appointment of the new Commission is bringing a radical restructuring of its departments. One of the first indications of the change is the decision to abolish the seemingly arbitrary administrative numbering of the various Directorates-General. The former "DG XII" thus becomes the Research Directorate-General - or Research DG for short. As a result, the DG's pages on Europa will be progressively transferred to the home page: **europa.eu.int/comm/research/**

The pages based on europa.eu.int/comm/dg12/ will, however, continue to work for the time being.

■ Another important simplification concerns the e-mail addresses of all the European Commission's personnel and departments.

As from 3 November 1999, the DG number in the mailboxes' domain names - dg12 in @dg12.cec.be for example - disappears, with the domain name becoming @cec.eu.int throughout the Commission. The old mailboxes will, of course, remain valid during a transitional period.

The changes to the principal home pages of the various research programmes and departments linked to research are set out in the table below, which also gives the addresses of the Europa and CORDIS web sites.

Departments/Programmes	e-mail	Web addresses
Communication Unit of the Research DG	research@cec.eu.int	europa.eu.int/comm/research/
Framework Programme	research@cec.eu.int	europa.eu.int/comm/dg12/fp5.html
Quality of Life and Living Resources	quality-of-life@cec.eu.int	www.cordis.lu/life/
Information Society	ist@cec.eu.int	www.cordis.lu/ist/
Competitive and Sustainable Growth	growth@cec.eu.int	www.cordis.lu/growth/
Energy, Environment, Sustainable Development	eesd@cec.eu.int	www.cordis.lu/eesd/
Nuclear Energy	eesd@cec.eu.int	www.cordis.lu/fp5-euratom/
International Cooperation	inco@cec.eu.int	www.cordis.lu/inco2
Innovation/Participation of SMEs	innovation@cec.eu.int	www.cordis.lu/innovation-smes/
	research-sme@cec.eu.int	www.cordis.lu/innovation-smes/
Human Potential	improving@cec.eu.int	www.cordis.lu/improving/

EU membership: research first

No sooner said than done! On 1 October 1999, 11 countries[1] which have applied for membership of the European Union - and their 150 000 researchers - formally became part of the EU research community. Their scientific institutions, universities and enterprises can now receive support under the Fifth Framework Programme on exactly the same terms as those in the EU's Member States.

Research is the first strictly Community policy to be opened up to these countries, which have to pay into the framework programme budget in return, and this reflects a "pre-accession" strategy aimed at helping these countries to complete the process of "coming up to standard" on which their Union membership ultimately depends. Renewing their infrastructures and modernising their industries, combating the deterioration of their environment, improving their competitiveness and boosting the standard of living for their people are all matters which of necessity involve an initial restructuring and strengthening of their scientific and technological capacities.[2]

Anticipating the formal association, their researchers were able to present projects under the first calls for proposals, published in the spring of this year. The calls met with an enthusiastic response from organisations in these applicant countries, indicative of the partnerships and mutual benefits that can now be enjoyed throughout this "extended Europe".[3]

(1) Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia

(2) See the supplement on the technological potential of these countries in RTD Info 22, May 99 - europa.eu.int/comm/dg12/rtd-inf22/etoc.html.

(3) For the National Contact Points for the Fifth Framework Programme in the 11 applicant countries, please consult: www.cordis.lu/fp5/src/ncps.htm

Science, the media and the citizen

Because it is bringing increasingly rapid change to social and individual life, science concerns everybody. Yet scientific communication - aimed at policy-makers, consumers, students, and citizens - is encountering more difficulties, incomprehension and misunderstandings than ever before. Scientists are the first to want people to understand the nature of their work, but most of the time they are not equipped to translate the complexity of their activities into readily accessible terms. Obliged to communicate through the media, they often have ambiguous relations with journalists; the pleasure of being in the spotlight is often coupled with a fear of simplification, distortion, misrepresentation and/or criticism of their work.

In order to initiate this fundamentally democratic debate on the public's understanding of science (one of the themes of the Union's Fifth Framework Programme for Research), the Research DG asked a specialist in scientific communication to compile a report on *"The media presentation of scientific and technical knowledge"*. This report is available on the Internet and **the Research DG invites anyone interested in this subject to contribute.**

Also note that the next issue of RTD Info (No. 25, February 2000) will include an in-depth report on this very interesting subject.

www.forum.europa.eu.int/Public/irc/dg12/Home/main (NB: case sensitive)
sandrine.sleiman@cec.eu.int

Contest for Young Scientists

"Once again the quality of the projects made the selection process particularly difficult - but at the same time singularly exciting. It is very stimulating to share the enthusiasm of these talented young people, to understand their motivations and observe their intelligence," explains Professor Pedro Guerreiro. He chaired the jury at the 11th Young Scientists Competition, held in Thessaloniki (GR) from 22 to 26 September this year, under the auspices of the Improving Human Potential programme. Eighty "young hopefuls" of European research from more than 30 countries presented 57 projects. All the projects - ranging from the most advanced astrophysics or mathematics to very concrete technological applications - had been undertaken by young scientists aged between 15 and 20.

The first three prizes (worth 5 000 euros each) went to Sarah Flannery, a young Irish mathematician, for her new approach to cryptography, three Icelandic astrophysicians - Sverrir Gudmundsson, Pall Melsted and Tryggvi Thorgeirsson - who highlighted remarkable properties in the analysis of a galaxy cluster, and Michal Ksiazkiewicz, a Polish student who has developed a methodology for evaluating urban pollution by analysing the condition of lichens. Three second prizes worth 3 000 euros and three others worth 1 500 euros also went to budding young researchers. Moreover, for the first time certain competitors will be given the opportunity to attend a training course at such centres of excellence as the European Commission's Joint Research Centre (Ispra, Italy), the European Northern Observatory (Canary Islands), the Norwegian Polar Institute (Spitzbergen) and the Royal Geographical Society (Seychelles).

To judge by the results of the previous competitions, for many of the participants - the contest should both confirm a vocation and serve as an initial springboard to a high-level scientific career or a more advanced development of a technological application. In this connection, among the jury members was none other than the vice-president of the European Patents Office and young 'inventors' were able to benefit on the spot from the opinions and advice of a team of experts appointed by the EPO.

The final of the Year 2000 Contest for Young Scientists will be held in Amsterdam (NL) from 18 to 24 September.

www.cordis.lu/improving/src/hp_ys.htm
europa.eu.int/comm/dg12/press/1999/pr2509en.html
graham.blythe@cec.eu.int

Winning technologies in the information society

The www.it-prize.org site presents the 25 high-technology innovations, selected from 261 European projects, which won the first round in the 1999 European IST Prize. With technologies ranging from network security systems to teleportable equipment, including remote-switching systems and interactive 3D-animation software, this selection is representative of original products with a high commercial potential developed by projects supported by the EU.

This winning group now competes for the three major IST 99 prizes (of 200 000 euros each) which are awarded at the Information Society programme's traditional annual conference (held in Helsinki from 22-24/11/ 1999 - see diary).

www.it-prize.org/

Calls for proposals: overview

Deadlines	1999		2000							
QUALITY OF LIFE AND MANAGEMENT OF LIVING RESOURCES (www.cordis.lu/life)										
KEY ACTIONS	**NOV[1]**	**DEC**	**JAN**	**FEB**	**MAR[2]**	**APR**	**MAY**	**JUNE**	**SEPT**	**OCT[2]**
Food, nutrition and health	15				x					
Control of infectious diseases	15									x
The "cell factory"	15				x					x
Environment and health					x					x
Sustainable agriculture, fisheries and forestry	15				x					x
The ageing population and disabilities					x					
Generic research	15									x
OPEN CALLS [1]	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUNE**	**SEPT**	**OCT**
Training: Marie Curie individual fellowships	3					12				11
Research training networks				1						
SME Measures (exploratory awards / cooperative research)			12			26			13	
Accompanying measures				10				x		11
Support for research infrastructure					15					11

(1) Call published on 6/3/99 - (2) Date of publication of the call finishing in March and October (dates to be fixed) scheduled on 15/12/99

USER-FRIENDLY INFORMATION SOCIETY (www.cordis.lu/ist)										
KEY ACTIONS	**NOV**	**DEC**	**JAN[1]**	**FEB**	**MAR**	**APR**	**MAY**	**JUNE**	**SEPT**	**OCT**
Systems and services for the citizen			17							
New methods of work and electronic commerce			17							
Multimedia content and tools			17							
Essential technologies and infrastructures			17							
Cross-programme themes			17							
Future and emerging technologies [2]			17							
Research networking			17							
OPEN CALLS	**NOV**	**DEC**	**JAN**	**FEB**	**MAR[2]**	**APR**	**MAY**	**JUNE**	**SEPT**	**OCT**
Future and emerging technologies [3][4][5]		Open until 15/9/2000								
Support measures [5]		Open until 15/9/2000								
SME Measures (exploratory awards / cooperative research) [6]			12			26			13	
Intelligent manufacturing systems		15				1				

(1) Call scheduled on 15/9/1999 - (2) Proactive initiatives - (3) Open sector - (4) Evaluation at least every 3 months - (5) Call published on 19/3/99 - (6) Call published on 16/3/99.

COMPETITIVE AND SUSTAINABLE GROWTH (www.cordis.lu/growth)										
KEY ACTIONS	**NOV**	**DEC**	**JAN**	**FEB**	**MAR[1]**	**APR**	**MAY**	**JUNE**	**SEPT[5]**	**OCT**
Innovative products, processes and organisation					15				15	
Sustainable mobility and intermodality					15				15	
Land transport and marine technologies					15				15	
New perspectives for aeronautics					15				15	
Measurements and testing research		15[2]			15[3]				15[6]	
Support for research infrastructure		15[2]			15[3]				15[6]	
OPEN CALLS [4]	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUNE**	**SEPT**	**OCT**
Training: Marie Curie individual fellowships	19				22				18	
SME Measures (exploratory awards / cooperative research)			12			26			13	
Accompanying measures	15				15				15	
Intelligent manufacturing systems		15				1			15	
Expressions of interest on research needs [1]		15					15			

(1) Periodical call scheduled on 15/12/99 - (2) Targeted call published on 15/7/99 - (3) See also the targeted call published on 15/10/99
(4) Batch evaluation dates, call published on 16/3/99 - (5) Periodical call scheduled on 1/6/2000 - (6) See also the targeted call scheduled on 15/4/2000

ENERGY, ENVIRONMENT, AND SUSTAINABLE DEVELOPMENT (www.cordis.lu/eesd)										
KEY ACTIONS	**NOV**	**DEC**	**JAN**	**FEB[1]**	**MAR**	**APR**	**MAY**	**JUNE**	**SEPT**	**OCT**
Sustainable management and quality of water				15						
Global change, climate and biodiversity				15						
Sustainable marine ecosystems				15						
The city of tomorrow and cultural heritage				15						
Cleaner energy systems, including renewables							1[2]			
Economic and efficient energy for a competitive Europe							1[2]			
Support for research infrastructures				15[3]						

(1) Call scheduled on 15/11/99 - (2) Indicative date, to be confirmed with the launching of the call - (3) Environment and sustainable development only

Periods for which deadlines have not yet been decided; these will be published in future calls.

Legends

Submission deadlines (for specific research actions)

Batch evaluation dates (for open calls)

For the latest information on calls of proposals for tender, see: www.cordis.lu/fp5/src/calls.htm

Deadlines 1999 2000

OPEN CALLS [1]	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	SEPT	OCT
Generic research			17			16				
Training: Marie Curie individual fellowships										
SME Measures (exploratory awards / cooperative research)			12			26			13	
Accompanying measures				15						

(1) Call published on 20/3/99.

NUCLEAR ENERGY (www.cordis.lu/fp5-euratom)

KEY ACTIONS [1]	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	SEPT	OCT
Nuclear fission										16

OPEN CALLS [1]	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	SEPT	OCT
Generic research										
Support for research infrastructures										
Training: Marie Curie individual fellowships			12					14		
Other training actions [2]					27				25	
Accompanying measures					27				25	

(1) Call published on 20/3/99 - (2) Special courses, research training networks, cooperation with countries outside the EU.

INTERNATIONAL COOPERATION (www.cordis.lu/inco2)

CALLS BY COUNTRY GROUPS	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	SEPT	OCT
States in pre-accession phase										
Copernicus 2										
Mediterranean partners (INCO-MED)										
Developing countries (INCO-DEV)										

OPEN CALLS	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	SEPT	OCT
Accompanying measures		16		16 [2]	16			16 [2]		16 [2]
Fellowships for Japan					1					

(1) Call published on 27/3/99. - (2) Call published on 15/6/99 - (3) New Independent States (NIS - former USSR) and other non-applicant Central and Eastern European countries - (4) Calls published on 27/3/99 except for group of emerging economies and industrialised countries for which a call will be published soon.

INNOVATION / PARTICIPATION OF SMES (www.cordis.lu/innovation-smes)

OPEN CALLS	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	SEPT
SME Measures (exploratory awards / cooperative research) [2]			12			26				13
Economic and technological intelligence projects [3]	2				2				2	
Innovation projects										
Promotion of innovative enterprises										
Innovation Relay Centres (IRC)										

(1) Several calls for proposals and calls for specific promotion and encouragement actions were published during March, and more will be published during 1999: refer to work programme - (2) Call published on 1/4/99 - (3) Accompanying measures - (4) Calls published on 15/6/99.

HUMAN POTENTIAL (www.cordis.lu/improving)

OPEN CALLS	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	SEPT	OCT
Research training network			Next deadline: 4/11/2000							
Marie Curie individual fellowships [1] [2]					15				13	
Marie Curie industry host fellowships								15		
Marie Curie development host fellowships and training sites			Next deadline: 16/05/01							
Research infrastructure: cooperative networks and exploratory workshops				15						
High-level scientific conferences				1						
Awards for first-class research			Call coming later							
Raising public awareness of science and technology						15				
S&T policy strategy: thematics networks [1]										5
S&T policy strategy: studies [2]			Open till 2/6/2000							
Accompanying measures for the programme [7]			Open till 28/6/02							

OPEN CALLS	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	SEPT	OCT
Socio-economic knowledge base					15					

(1) Call published on 2/3/99 - (2) Individual fellowships, return fellowships, experienced research fellowships - (3) Call scheduled on 15/02/2000
(4) Call published on 11/6/99 - (5) Call scheduled on 15/11/99 - (6) Call scheduled on 15/1/2000 - (7) Open call published on 16/6/99 - (8) Call scheduled on 15/6/2000

Diary

■ *Living with natural hazards* - 17-19/1/2000 - Vienna (A)
schwab@arsenal.ac.at.

■ *Photovoltaic solar energy* - 1-5/5/2000 - Glasgow (UK) - Organised by the JRC.
pv.conf@jrc.it
www.wip.tnet.de/pv00.htm

■ *Eureka meets Asia* - 23-27/5/2000 - Macao (China) - The second of the Europe-Asia meetings (the first was in 1998), focusing on technologies for sustainable development.
Isabel Caetano - Agencia de Innovação (P)
icaetano@adi.pt
www.adi.pt

■ *CRIS-2000* - Knowledge at work - research information for society - 25-27/5/2000 - Helsinki (FI) - The fifth such event, organised by the Innovation and Participation of SMEs programme, will be looking at innovative approaches opened up by the Internet for creating and disseminating research information. The CRIS-2000 Cybercafé will be opening in preparation for the event.
cris2000@hut.fi
www.hhut.fi.misc/cris2000
ww.cordis.lu/cris2000

■ *Official opening of Expo2000* (and the Union pavilion) - 1/6/2000 - Hannover
www.expo2000.de/englisch

■ *Beyond the genome: the use of molecules and cells, the challenges of the third millennium* - 18th International Congress of Biochemistry and Molecular Biology - 16-20/7/2000 - Birmingham (UK)
info@iubmb2000.org

■ *EurOCEAN 2000 - the European Conference of marine sciences and technologies* - 29/8-2/9/2000 - Hamburg (D)
klaus-gunther.barthel@cec.eu.int
www.iubmb2000.org/

Women and Science

The first "Women and Science" day, organised by the European Commission in April 1998, brought together many women researchers. The event gave an additional impetus for further reflection on the issue of gender in the world of research. It also allowed women scientists to compare their experiences and to consider ways of increasing their presence in what is often the very male-dominated field of R&D.
Last July, 100 representatives from various female researcher networks met in Brussels. The aim was to mobilise their members to actively participate in the Fifth Framework Programme and to consider how women can campaign more effectively for equal opportunities. They decided to set up a European "network of networks" for the purpose.
All those interested in learning about the latest developments on this issue (in particular the gender dimension the Union's policy and research programmes), will find information, links and valuable contacts at the following address:

www.cordis.lu/improving/src/hp_women.htm

Less plutonium on the roads

Under the Euratom treaty, all the major European centres for reprocessing plutonium from civil nuclear plants are obliged to send "safeguard" samples for analysis to a limited number of European Commission-accredited laboratories. The consequent increase in plutonium transport, sometimes over long distances, is a significant source of risk that requires strict and costly security checks.
The Euratom Safeguards Directorate therefore set out to develop a system for verification and analysis at the reprocessing sites themselves. To do so, it brought in the know-how of the Joint Research Centre's Institute for Transuranium Elements in Karlsruhe (D), which developed the concept and equipment for an On Site Laboratory (OSL). The finishing touches were put to this ideal tool for analysing plutonium samples, which includes high-precision instruments and many automated and robotic functions, during installation at the Sellafield (UK) site, managed by British Nuclear Fuels (BNFL). The satisfactory results of this first system should make it possible to create other OSLs at various European reprocessing centres.

www.jrc.org

Scientific hospitality is doing well

When it was launched ten years ago, the "Access to Large Scale Facilities" programme was intended essentially as a means of allowing European scientists to carry out studies at the principal European installations for synchrotron radiation and neutron sources. Since then, the idea has gained ground and the EU has stepped up its efforts to facilitate the access of researchers to most of the principal scientific and technological infrastructures in the various Member States - and in virtually all disciplines.
Continued with increased resources under the Fifth Framework Programme, this system which allows researchers to spend time at laboratories located outside their national borders is proving very successful. With a budget of 15 million euros, the first call launched this year brought a record 165 proposals from laboratories in 20 countries seeking to open their doors to scientists from abroad. Of the host offers received, of particular note are those from infrastructures in Fifth Framework Programme associate countries, including the Czech Republic, Hungary, Iceland, Israel and Norway. The results of the final selection will be made known early in 2000. The next call for proposals will be in 2001.

improving-ari.sti.jrc.it/access
campbell.warden@cec.eu.int

50 years of steel

The signing of the ECSC Treaty (1951) was the first step towards European integration. Since then, cooperation in the steel industry has been a consistently active area of EU policy, especially in terms of research. Initially, the Steel programme made it possible to create a spirit of European cooperation, permitting exchanges between scientists, researchers, producers and users. Priorities and objectives subsequently evolved in line with new market requirements and the socio-economic climate. Improved processes brought new applications for steel products. In recent years, researchers have been focusing increasingly on sustainable development and environment-friendly technologies. Finally, the integrated approach has allowed production to increase while taking a range of factors into account - environment, safety, product improvement - with the recycling of by-products, a reduction in harmful waste, the potential use of steel in housing, etc.

ecs-steel@cec.eu.int

Publications

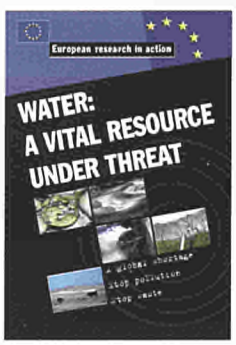
Due to lack of space, the publications mentioned below are limited to a few recent titles likely to be of interest to a relatively general public.
Readers with specialised interests should consult the Internet for more complete lists and updates of the Research DG's publications, especially those concerning the scientific results of projects supported by the Commission. See the site:
europa.eu.int/comm/dg12/pub_rtd.html
For a more extensive look at all European Union publications, we recommend the Office for Official Publications of the European Communities (EUR-OP)
eur-op.eu.int/

■ *European science and scientists between freedom and responsibility* - proceedings of a conference held in Amsterdam in 1997
Catalogue EUR-OP: CG-46-96-010-EN-C
■ *Ethical, legal and social aspects of life sciences and technologies in FP4 programmes*
ornella.vaglietti@cec.eu.int
■ *Interdisciplinarity and the organisation of knowledge in Europe* - proceedings of the Cambridge conference (September '97)
annette.paternostre@cec.eu.int
■ *Electronic communication and research in Europe* - proceedings of the Darmstadt conference (April '98)
annette.paternostre@cec.eu.int
■ *From ecosystem research to sustainable development*
Catalogue EUR-OP: CG-NA-18-847-EN-C
■ *Planet Earth: an environment special edition* - RTD results supplement of CORDIS Focus magazine - ISSN 1022-6559
helpdesk@cordis.lu

■ *New possibilities for accessing the capital markets for small and medium-sized biotech enterprises* - EUR 18908 - ISBN 92-828-6925-3
quality-of-life@cec.eu.int
■ *The European Guide to Science, Technology and Innovation Studies* - EUR 18350 - An analytical inventory of the approximately 100 European higher education and research institutions engaged in the study and analysis of strategic links between science, technology and innovation. This unique guide, also available on the Web, is the result of socio-economic research cooperation supported by the European Union.
www.chem.uva.nl/sts/guide - anne.de-greef@cec.eu.int
■ *Classrooms for Distance Teaching & Learning: a Blueprint* - Leuven University Press (B) - The result of the European BIC (Blueprint for Interactive Classrooms) project undertaken by a consortium of European universities from Belgium, France, Finland, Italy and Ireland, this manual provides practical information and advice on setting up and using interactive distance presence systems in teaching.
www.linov.kuleuven.ac.be/bic
gee.cammaert@linov.kuleuven.ac.be
university.press@upers.kuleuven.ac.be
■ *Strategies and policies on research training in Europe*
georges.bingen@cec.eu.int
■ *Improving human capital* - Special issue of the IPTS Report - n° 37 - Sept. 99
■ *Europe 2010: prospects and scenarios* - Special issue of the IPTS Report - n° 38 - Oct. 99
ipts_secr@jrc.es
www.jrc.es/pages/f-report.fr.html

Research explained to European citizens

Last year the Research Directorate-General launched a series of publications entitled **European research in action**. These illustrated leaflets explain and comment on the Union's efforts in the field of science and technology in the face of diverse challenges, both natural and social.
Five documents, published in the Union's 11 languages, are currently available:
■ The threat of natural disasters
■ Water: a vital resource under threat
■ The planet under pressure
■ Better health for all
■ Focus on employment
These very readable publications - which will soon be available for browsing on the Research DG website - are based on a brief analysis of the challenges faced in these various fields and the way research EU-supported can help. They could be particularly useful for research institutions seeking to make a wider public more aware of their contribution to European research on major themes.

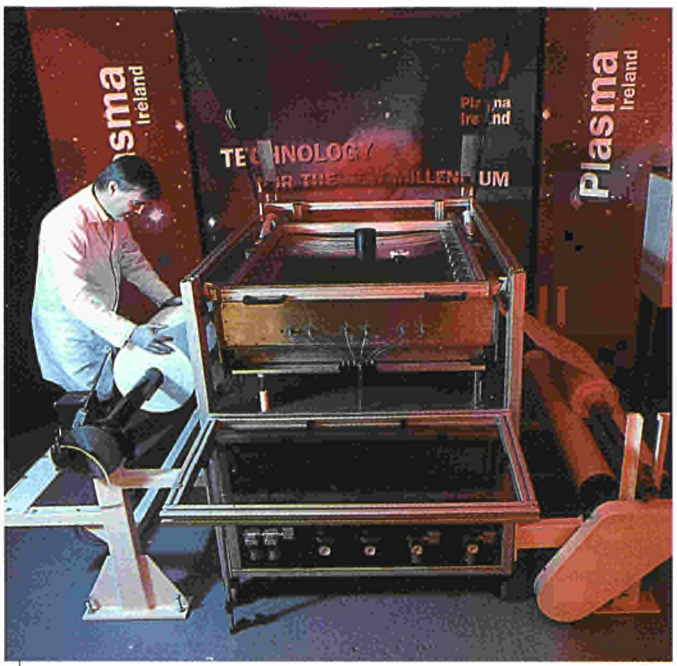


research@cec.eu.int
http://europa.eu.int/comm/dg12/leaflets/disasters/en/

Plasma conquering the textile industry

European scientists and industrialists working on the Plasmatex project are on the point of demonstrating the feasibility of a technology of the future: textile processing using plasmas at atmospheric pressure. This development meets new needs in a sector where Europe is still very active.

Since their introduction in the 1960s, the main industrial applications of the low-pressure and low-temperature properties of plasmas (see box) have been in microelectronic etching. In the 1980s, these uses broadened to include many other surface treatments, especially in the field of metals and polymers. Now, research laboratories in the textile industries have also begun experimenting with plasma processing in a range of applications.



Three prototypes produced by Plasma Ireland are now on site and in use by the industrial partners on the Plasmatex project.

Multifunctionality

"Unlike liquid processes which penetrate deep into the fibres, plasma produces no more than a surface reaction, the properties it gives the material being limited to a surface layer of around 100 angstroms," [1] explains Roshan Shishoo, director of the Institute of Fibre and Polymer Technology Research (IFP) in Mölndal (Sweden) and coordinator of the Plasmatex[2] project.

These properties are very varied and can be applied to both natural fibres and polymers, as well as to non-woven fabrics, without having any effect on their internal structures. For example, plasma processing makes it possible to impart hydrophilic or hydrophobic properties to the surface of a textile, or reduce its inflammability. And while it is difficult to dye synthetic fabrics, the use of reactive polar functions results in improved pigment fixation. Finally, with plasma containing fluorine, which is used mainly to treat textiles for medical use, it is possible to optimise biocompatibility and haemocompatibility - essential for medical implants containing textiles.

Clean and efficient technology

Other advantages of plasma technologies stem from the underlying physical process. The traditional liquid chemical processes used by the textile industry involve high consumption - and pollution - of water resources. Waste-processing costs are also high and drying the processed fibres uses a lot of energy. This makes "dry" processing using plasma technology all the more attractive - especially for the environment. In addition, the speed of the process (just a few minutes, or even seconds) reduces energy consumption still further.

Beating the vacuum

"Despite all these significant benefits demonstrated in the laboratory, plasma processing has failed to make an impact in the textile sector because of a particular constraint which is incompatible with industrial mass production," continues Roshan Shishoo. "All the technologies developed to date are based on the properties of low-pressure plasmas. The process must take place in an expensive, closed-perimeter vacuum system and cannot be used for production lines operating at room temperature, with machines processing fabric 2 metres wide at high speed."

This is the challenge that a new generation of APPS (Atmospheric Pressure Plasma Systems) developed by Plasma Ireland is about to overcome. The company has now developed a technology offering comparable performance at ambient pressure to that of "glow discharge" plasmas requiring a partial vacuum. The aim of the Plasmatex project is to perfect the application to the textile sector of this technological advance, which is unique in Europe.

In addition to Plasma Ireland and the IFP, members of the Plasmatex project team include another scientific research centre (the physics laboratory at Queen's University Belfast, UK), the British textile machine manufacturer Web Processing, and six companies producing a diverse range of textile products. The partners are studying

the industrial feasibility of APPS technology and conducting full-scale tests to determine the relationships between the physical properties of different types of plasma and the results obtained, as well as the way the plasmas interact with various materials.

Three prototypes in the service of industry

Three different prototypes supplied by Plasma Ireland have been installed on production lines and are being used by the consortium's industrial partners to help further the research. The first, in operation at the IFP, has been made available to the Swedish companies Almedhals (specialising in the adhesion of polymer coatings), Borgstena Textile Sweden (automobile textiles) and SCA Hygiene Paper. The second is in Germany, at Kirchhoff, a company which works with wool fibres and is interested in testing plasma technologies as a possible way of eliminating felting. This same equipment will be made available at a later date to Polisilk of Spain, a suitcase manufacturer which wants to improve the binding properties of polypropylene-based coatings. The third prototype is being tested by the British group, Scapa, which specialises in products for the printing and textile industries.

"Europe should soon have an innovative and competitive tool which we intend to make available internationally," believes Tony Herbert, project manager at Plasma Ireland. "There are only two or three other systems using plasma at atmospheric pressure currently at the development stage - in Japan and the United States - but no wide-ranging application for the textile sector is available yet. So the prospects are extremely promising." ■

Contacts
Roshan Shishoo - IFP - Mölndal (S)
Fax: +46 31 7066363
roshan.shishoo@ifp.se
Tony Herbert - Plasma Ireland Ltd - Cork (IRL)
Fax: +353 21 506 106
tony.herbert@plasma-ireland.com
www.plasma-ireland.com

(1) One angstrom = one ten-thousandth of a micron.
(2) The Plasmatex (Development of Plasma Technology for Continuous Processing of Textile Fabrics and Nonwovens) project was launched under the Fourth Framework Programme as part of the Brite-Euram programme

From the stars to industry

When you increase the temperature of matter, it passes successively through its solid, liquid and gaseous states. But if you continue to heat it, it undergoes a further transformation of an altogether different kind. Collisions between particles of matter increase and the initial gaseous state, comprising neutral molecules or atoms, develops into an ionised state with an equal density of positive ions and negative electrons. This mix of charged particles is called a plasma and constitutes the 'fourth state of matter' commonly found in nature. The corona of stars (such as the sun), the ionosphere, which surrounds the Earth at an altitude of between 60 km and 700 km, and the flames of a fire are all natural plasmas.

There has been scientific and technological interest in the properties of plasmas for some time now, their first large-scale application being in neon lights which were introduced several decades ago. The ability to control both particle energy and temperatures in low-pressure plasmas has opened up wide ranges of application in many different areas. By depositing a material in a plasma derived from one of a wide range of gases it is possible to develop quite remarkable surface treatment processes, which are virtually impossible to obtain by traditional solid or liquid methods.

On an altogether different scale, the leading-edge European research on the futuristic energy source of nuclear fusion is also focusing on the physical properties of plasma, this time at extraordinarily high temperatures.

Fuzzy logic on the European test bed

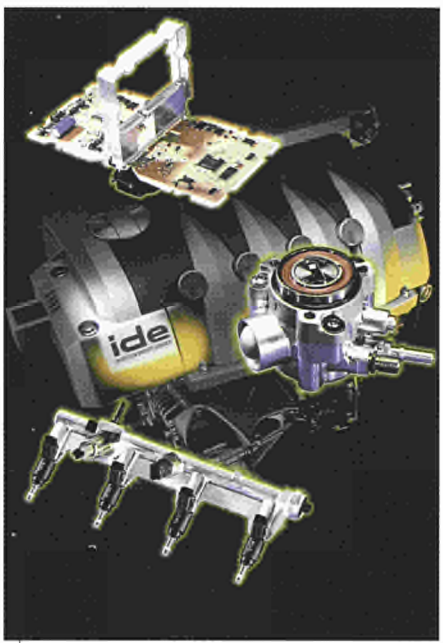
Hugues Bersini

A strange frontier divides automation into two fields. On the one hand you have the engineers in South-East Asia who swear by "fuzzy" control. On the other, the European and US champions of automated systems based on traditional linear control. The Famimo project sets aside any such partisanship and puts the industrial promise of "fuzzy" systems to the test.

What is the purpose of a science as abstract as logic? Over a hundred years ago, the mathematician George Boole (1815-1864) could never have imagined that the principles of his Boolean algebra would one day provide the operating basis for the "intelligent", digital machines which are helping to run our planet as we approach the third millennium.

But is the dominance of such binary logic unassailable?[1] In 1965, as more and more sophisticated computer languages were being developed, Lotfi Zadeh, at that time Chairman of the Department of Electrical Engineering at the University of California, Berkeley, conceived a "shades of grey" approach which is intuitively closer to the perception and reasoning of the human brain. Rather than being satisfied with a truth or its opposite - the response being either yes (1) or no (0) - he preferred to consider the relative states of truth. "If all people less than 1.65 m in height are classed as small and those up to 1.75 m as average, an individual measuring 1.64 m is nearly average and another of 1.66 m is nearly small. Zadeh developed this theory of logic not on the basis of membership but on the degree of membership," explains Hugues Bersini, of the Institute for Interdisciplinary Research and Development in Artificial Intelligence (IRIDIA) at the Université Libre de Bruxelles and coordinator of the Esprit programme's Famimo project.

"The special characteristics of this approach are seen even in the rather poetic name Zadeh gave it: fuzzy logic."



A participant in the Famimo project, the Siemens Automotive laboratories in Toulouse (F) are studying the performances of fuzzy logic applied to new direct-injection engines.

Asian infatuation

This new theoretical concept did not have much immediate impact. But in the late 1970s, the British logician Abe Mamdany returned to the theory, showing that it was possible to create control systems that operate on the basis of fuzzy logic. For some strange reason his work attracted most attention among Asian engineers, with automation experts in Europe and the US continuing, for the most part, to ignore applications of this "other logic" in automatic control techniques.

In Japan, Taiwan and Korea, the fuzzy approach met with a surprisingly enthusiastic response, leading to a veritable explosion in fuzzy logic control systems in every imaginable field in the 1980s. The world's first automatic underground train in Japan, the experimental simulation of a pilotless flight by a miniature helicopter, and control systems built into the most familiar everyday objects - such as cameras, video recorders and household appliances of all kinds - all used fuzzy logic.

"Two very distinct control cultures developed, each one ignoring the other. No doubt this is because the majority of specialists in automation in the West are mathematicians and very rigorous scientists. In Europe, the benefits of fuzzy logic continue to be strongly contested," continues Hugues Bersini.

An objective exploration

But there was good reason for such resistance. The performance and stability - an essential point when it comes to control - of the traditional automatic systems[2] widely used in Europe and the United States are every bit as effective as Asia's fuzzy control systems, in particular when managing sophisticated multi-input/multi-output systems. "In any event, that is the situation at present. But one may well wonder about the grounds for such disinterest or distrust in the medium to long term. The field of artificial-intelligence systems is constantly evolving with the

"If all people less than 1.65 m in height are classed as small and those up to 1.75 m as average, an individual measuring 1.64 m is nearly average and another of 1.66 m is nearly small."

progress in information technology, which is now entering the age of neural networks. It is perfectly legitimate to ask whether the concept of fuzzy logic may not have greater potential for managing the control systems of the future. Europe would be wrong not to explore this avenue which could have major implications for its industry in the future," explains the project coordinator.

Hence the reason for the Famimo project, bringing together six of the best European centres of excellence in the field of control and automated systems, located in Sweden, the Netherlands, Belgium, France and Spain. "Among these partners, there are those both for and against. But the objective of the project is to go beyond the cultural divide separating the two types of logic. Faced with complex non-linear problems, should fuzzy control be classed as a technology with no future or, on the contrary, does it have vital potential in the context of new IT control configurations?"

Two tests

Specifically, Famimo is developing fuzzy-control tools for two concrete, highly complex, non-linear control situations. It aims to verify their suitability and assess their performance, in particular in relation to traditional PID approaches.[3] If successful, this could provide a new range of software tools to be incorporated into the automation engineer's 'toolbox'.

The two tests are being carried out in very different control fields: the automatic management of fermentation processes at a water-treatment plant for the paper industry, and control of the new generation of direct-injection car engines, which is still at the prototype stage. Siemens Automotive is a keen participant in the latter experiment. The industrial stakes are high in what has become a race against time to achieve an increasingly accurate control over fuel combustion, in order to reduce polluting emissions drastically and cut consumption.

The age of learning machines

Famimo's ambition is to provide clear-cut answers - with supporting proof - in the fundamental debate on artificial intelligence in which fuzzy logic is seen as potentially opening up new avenues - namely the ability of control systems to learn control rules for themselves on the basis of their specific operating conditions. For it is in the area of learning that the fuzzy-logic controller offers the most interesting prospects.

"Thanks to increasingly powerful and more decentralised information technology, it now seems possible to suggest control techniques based on evolutionary learning. Thanks to its vast capacity for trial-and-error, a computer is able to generate solutions which work, without our needing the mathematical tools to understand what is happening. However, that remains to be proved; it's a very new area of the cognitive sciences." ■

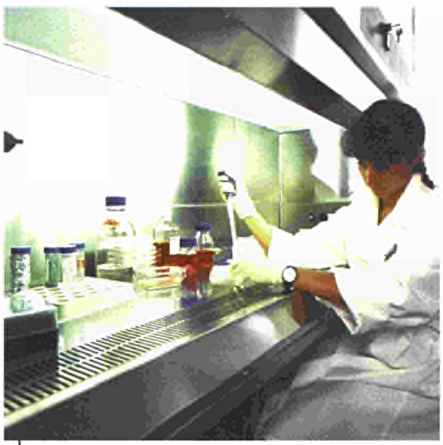
(1) In simple terms, this logic recognises just two conditions (membership or non-membership of a group).
(2) Fuzzy Algorithms for the control of MIMO - multi-input, multi-output - processes. In addition to IRIDIA, Famimo also includes Siemens Automotive and LAAS (Laboratory of Automation and Systems Analysis) in France, the University of Delft (NL), the University of Seville (E) and the Department of Automatic Control at Lund Institute of Technology (S).
(3) Traditional linear control is based on the PID (Proportional-Integral-Derivative) concept.

Contact | **Hugues Bersini**
IRIDIA, Université Libre de Bruxelles (B)
bersini@ulb.ac.be
http://iridia.ulb.ac.be/~famimo/

Science without guinea pigs

Millions of animals are subjected to experiments in European laboratories every year - all for the benefit of mankind. But could science, medicine and industry dispense with such practices? The 3rd World Congress on Alternatives and Animal Use in Life Sciences, held in Bologna at the end of last summer, provided an occasion both to assess the situation, and for wide-ranging debate.

Replace. Reduce. Refine. The 'Three Rs' rule was first formulated in The Principles of Humane Experimental Technique[1] by William Russell and Rex Burch. Forty years ago, these two British scientists defined three objectives in the field of experimentation on living creatures. They advocated the use of any scientific method using "insentient material" which could replace methods using "conscious living higher animals"; any means of reducing "the number of animals used to obtain information of a given amount and precision"; and, in regard to refinement, any development leading to a "decrease in the incidence or severity of inhumane procedures applied to animals".



European Centre for the Validation of Alternative Methods (ECVAM) - Institute for Health and Consumer Protection (JRC-Ispra) - Analysis of culture cells.

The implication of these three principles, and progress made in applying them, were discussed at length during the 3rd World Congress on Alternatives and Animal Use in Life Sciences, held in Bologna (I) under the auspices of ECVAM (European Centre for the Validation of Alternative Methods), from 29 August to 2 September 1999. The event - the occasion for no fewer than 65 conferences, workshops and debates - was attended by some 800 researchers, as well as representatives of legislative authorities and animal-welfare campaigners.

Experiments: a decade of progress

"Many researchers are now working on these Three Rs and more and more countries are incorporating them into their legislation. The situation changed a great deal in this field during the 1980s," pointed out William Russell, who was present at the debates. He cited the creation of the NCA (Netherlands Centre on Animal Use), the Zebet (Centre for the evaluation of alternative methods to animal experiments) in Germany, and the CAAT (Centre for Alternatives to Animal Testing) at the Johns Hopkins University in the USA, by way of example. Having reached a peak in the mid-seventies, it now seems that this type of experimentation is diminishing generally. In France, for example, the number of laboratory animals fell from 7 million in 1980 to 2.6 million in 1997.

A growing number of alternative solutions are being made available to researchers. Organ, cell and tissue cultures are now commonplace while our improved knowledge of genetics is making it possible to study certain human biochemical me-

(1) London, Methuen, 1959 (also available on-line at http://altweb.jhsph.edu/science/pubs/humane_exp/het_toc.htm)

EU-backed alternatives

Upstream of the validations coordinated by ECVAM, the European Union also supports various research projects aimed at developing alternative methods to animal experimentation. Some 15 projects - focusing in particular on the development of tests based on cell or tissue cultures - were carried out under the Fourth Framework Programme. New methods are currently being encouraged under the Quality of Life and Management of Living Resources programme. Also, the dissemination of in vitro techniques is being encouraged by the IVTIP (In Vitro Testing Industrial Platform), a group of Europe's leading pharmaceutical and cosmetics companies.

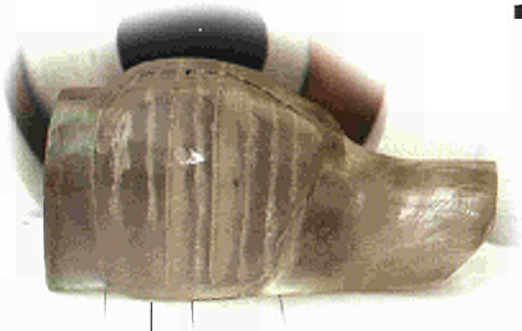
At the Bologna congress, Epiflow - developed by Professor Pfaller's team at the Institute of Physiology, Innsbruck University, and supported by the EU - won a prize of 2,000 dollars, an award made by the RIVM (Netherlands National Institute for Public Health and the Environment) and the ICAAT (Institute of the Centre for Alternatives to Animal Testing) to encourage the development of alternative methods. Selected from the 200 projects presented, the Epiflow project developed a new cell culture system using a continuously changing environment and a constant gas supply. The process developed makes it possible to maintain primary cultures of differentiated cells during much longer periods than conventional systems, thereby permitting tests of chronic toxicity. The device also makes it possible to produce co-cultures of two different types of cell.

> "It is accepted today that an experiment on an animal is only authorised if the expected benefit outweighs the suffering inflicted upon it."

chanisms in micro-organisms. Innovative molecular biology techniques are resulting in the application of tests based on the use of isolated enzymes (some of which have replaced the thousands of rabbits and rats used 25 years ago for pregnancy tests). Physics, mathematics and information technology are also making their contribution to the Three Rs, with imaging techniques, modelling, non-invasive methods of investigation, telemetry and biostatistics helping researchers to learn as much as possible from the data available.

Testing: European validation

But animals are not used solely for research purposes. They are also used in regulatory testing for standardised evaluation of the possible dangers of substances released onto the market. In this sector, which makes it possible to guarantee that consumers are both protected and well informed, it is much more complicated to replace animal experimentation and consequently progress has been slower. This is why ECVAM (European Centre for the Validation of Alternative Methods), was set up at the Joint Research Centre in Ispra, in 1991. "Validation aims to show the reliability and pertinence of an established test procedure in relation to a particular objective. Our principal mission is to facilitate and coordinate the validation of new procedures adopted at Union level and for this we work in close cooperation with the authorities, universities and industry in the Member States," explains Michael Balls, the centre's director. With an annual budget of around 6 million euros, ECVAM allocates half this amount to research, two-thirds of which goes to contracts with European university or industrial laboratories.



Model of a dog's head subjected to radiation.

To date, ECVAM has validated a phototoxicity test and three others in the field of skin corrosion. The validation of another test for vaccines should be completed within the next three months and other research is under way, in particular on the risks of skin sensibilisation and irritation, haematotoxicity, nephrotoxicity, reproduction toxicity, toxicity of the metabolism, neurotoxicity and metal toxicity. The methods validated are at present being studied by the European and international regulatory bodies - in particular the OECD - whose recommendations are applied to tests carried out in the EU, North America, Japan, Australia and New Zealand.

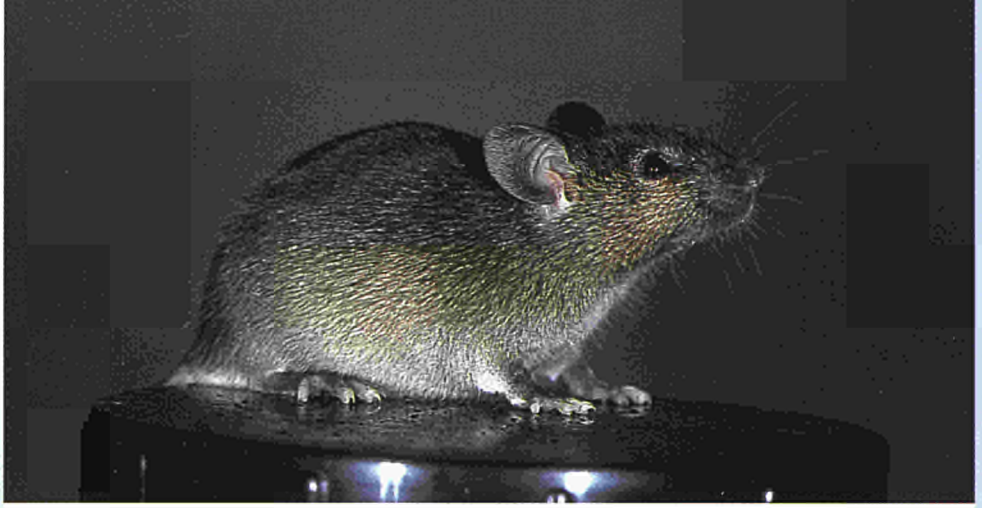
Ethics and necessity

As co-organiser of the "Bologna Congress", Michael Balls is pleased to have provided the opportunity for dialogue between scientists and members of animal rights associations, even if at times they took up opposing positions in the invariably lively debates. But then the scientists themselves were far from being all of the same opinion. "The atmosphere was constructive," stresses the ECVAM director. "These two worlds came together to speak and listen to each other. The researchers are now more ready to answer questions about their work than was previously the case." A relative consensus led the delegates to add guidelines on animal experimentation to the 1964 Helsinki declaration which lays down the principles of the use of humans by science, placing the emphasis on the "Three Rs".

European directives

European Directive 86/609/EEC on the protection of animals used for experimental and other scientific purposes stipulates that the Commission and Member States must encourage research aimed at developing and testing other techniques able to provide the same level of information as that obtained by experiments carried out on animals, but which use fewer animals or less painful procedures. Although Member States must provide the Commission with certain statistical information on the use of animals for experimental and scientific purposes, it was not until 1997 that the national authorities responsible for implementing the directive reached agreement on a body of harmonised statistical data. Present figures (1996) therefore continue to reflect approaches for which it is difficult to obtain genuinely comparable information.

There is also an earlier directive (76/768/-EEC) on harmonising Member States' legislation on cosmetic products. This stipulates, through recent amendments, that Member States must ban the marketing of cosmetic products containing ingredients or combinations of ingredients tested on animals since 1 January 1998. Its application - postponed until June 2000 - remains subject to the development of methods able to adequately replace animal experimentation and scientifically validated as providing the consumer with an equivalent level of protection.



The number of animals used in the laboratory has been falling over the last 30 years. In France, from 7 million to 2.6 million between 1980 and 1997. But rodents and rabbits still account for 81% of the warm-blooded animals used as guinea pigs.

These "Three Rs" do not, however, mean the end of such practices. "It is accepted today that an experiment on an animal is only authorised if the expected benefit outweighs the suffering inflicted upon it," stresses Bert van Zutphen, an expert in genetics and animal models, and professor at the Faculty of Veterinary Medicine at Utrecht University (NL). "There remains the question of who evaluates the cost/benefit ratio, and how. In several European countries, such as Sweden, the Netherlands, the United Kingdom, Germany and France, this type of experimentation has to be approved by an ethics committee."

Species and genes

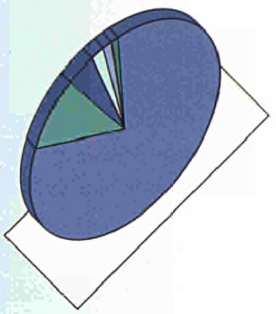
A majority of scientists take the view that the study of many diseases and the search for effective treatments will always require the use of animals. The liveliest debates therefore often revolve around the choice of species. "The phylogenetic proximity of man and non-human primates makes the latter the ideal model for the development of drugs and vaccines against diseases such as Aids, malaria or yellow fever," believes Jann Hau of the Department of Comparative Medicine at Uppsala University (S), while for Michael Balls, "The greater the proximity between non-human primates and man, the stronger the ethical and humanitarian reasons for not using them." Martha Armstrong, of the Humane Society of the United States, notes a growing reluctance among laboratory personnel to working with certain "domestic" animals such as cats and dogs.

Finally, for a number of years now, gene transfer techniques have been raising new questions on the use of animals. "The methods and objectives can vary greatly and prudence is required," explains Michael Balls. "It could be possible, for example, to imagine a transgenic ewe whose milk contains a protein of interest. The milk would be collected, the protein extracted, and the ewe would not be affected. A totally different approach involves producing animals possessing the desired genetic message to develop a human disease, such as cancer. Such an approach could lead to progress in research into the disease. But this does not alter the fact that we must consider the welfare of animals on a case-by-case basis. My personal hope is that in the future we will not have to use them at all. This implies persuading an increasing number of scientists that such an approach is well founded and that we must pursue our work so that this desire can become a reality." ■

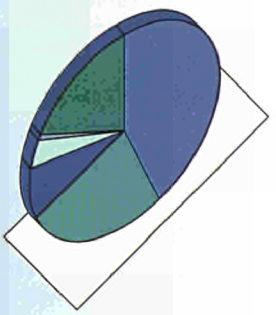
Contact | **Michael Balls**
ihcp.etomet.net/nextihep/units/ecvam.html
michael.balls@jrc.it

How many? Which ones? Why?

In 1996, 11 646 130 animals were used for various experimental purposes in the EU. In 1991, the figure was 11.8 million - but that was for just ten countries. Rodents and rabbits account for 81% of the warm-blooded animals used in experiments.



Rodents and rabbits:	81.3%
Cold-blooded animals:	12.9%
Birds:	4.3%
Artio- and perissodactyles (horses, donkeys, pigs, goats, sheep, deer, cattle):	1.1%
Carnivores:	0.3%
Prosimians and simians:	0.1%



R&D and quality control on products and devices used in human medicine and dentistry and veterinary medicine	44%
Fundamental biology studies	25%
Toxicological tests and other safety evaluations	9%
Diagnostics	4%
Teaching and training	1%
Other	17%

Source: Statistics on the number of animals used for experimental and other scientific purposes in the Member States of the European Union - 1996

In vitro epidermis

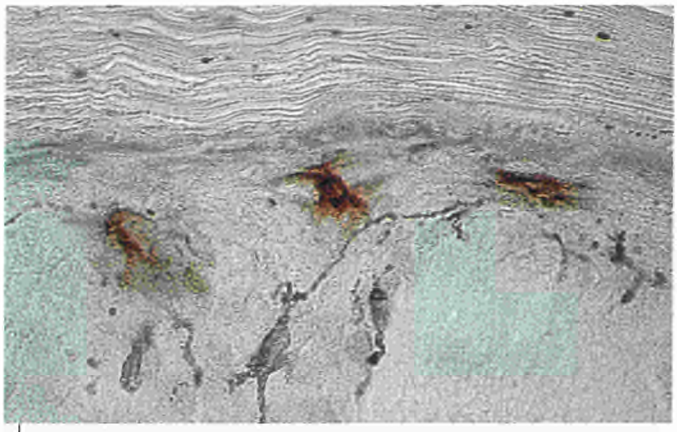
In a first of its kind, a team of researchers from L'Oréal working on a European project has constructed synthetic skin which is sensitive to ultraviolet rays and has functional immune cells. It is already providing a new tool for the in vitro study of allergies and may one day help eliminate the need for experiments on animals.

"In vitro dermatology began in 1975," explains Rainer Schmidt, a researcher at L'Oréal. "That was when a US laboratory first described a technique for reproducing keratinocytes in culture." The principal cells of the epidermis, keratinocytes multiply, transform[1] and migrate to the surface, forming the skin's tough outer layer. This provides the barrier which protects us against injury and dehydration.

Until the early 1990s, synthetic skins consisted of keratinocytes but not melanocytes or Langerhans cells. The former synthesise the melanin which is responsible for tanning the skin and protecting it against the sun's rays; the latter play a vital role in immunological functions.

From the tanned prototype ...

In 1992, the L'Oréal laboratories, in cooperation with a number of research teams, succeeded in adding melanocytes to their prototype skin. As a result, the cultured epidermis was able to "tan" when exposed to UV radiation. This allowed the researchers to study the effects of various substances on the quality of the epidermis in detail and to measure exactly how much protection a sunscreen lotion provides. Specific products designed for precise skin types were subsequently developed using melanocytes taken from skins of different ethnic origin.



Histological section of a synthetic epidermis containing Langerhans cells and melanocytes.

These early examples did not, however, allow the researchers to study the various immunological functions of the epidermis - the origin of over-sensitivity and allergies. In order to complete the synthetic skin, Langerhans cells had to be introduced. These are derived from "progenitor" cells produced in bone marrow. When released into the blood, they differentiate to a wide variety of cell types and migrate to the epidermis. It is the extent of this differentiation which makes it impossible to add them to synthetic skin from a biopsy.

... to immune responses

In 1997, while working on an EU-backed research project,[2] the coordinator, Rainer Schmidt, became the first person to succeed in producing synthetic skin containing keratinocytes, melanocytes and Langerhans cells.[3] The team used progenitor cells taken from umbilical cord blood, where these cells are particularly numerous. "We were afraid that the progenitor cells would not differentiate, because we knew nothing about this process. We initially planned for several intermediary stages before realising that, in reality, it is the keratinocytes themselves which control the differentiation and the implantation of the Langerhans cells."

When they exposed the synthetic skin to UV radiation, researchers were able to observe the disappearance of the Langerhans cells, which migrated out of the epidermis, demonstrating this phenomenon linked to UV-exposure-related immunosuppression for the first time *in vitro*. The project also showed that Langerhans cells change form and migrate when exposed to a powerful allergen, while remaining insensitive to a simple irritant. There is every indication that this "model" skin really works. "We have taken a step which will allow us to use this model in order to better study and understand the role played by the epidermis' cells in a contact allergy," concludes Rainer Schmidt. "And we now have human cells available which we can subject to any kind of treatment we like. I can tell you that I much prefer working with synthetic skin than with an animal, no matter what species." ■

(1) The so-called cellular differentiation phenomenon.
(2) New immuno-pharmaco-toxicological model: human reconstructed epidermis containing Langerhans cells. This project was supported by the Biotech programme (Fourth Framework Programme).
(3) This technique has since been patented.

Contact Rainer Schmidt
Fax: +33-1-47567965
rschmidt@recherche.loreal.com

The genes of silence

Locked away in an impenetrable world, many autistic people are unable to communicate their feelings. European and US researchers are now trying to identify the genes which make a person susceptible to the development of this disorder. The first results of their work represent an important step forward in our understanding of the condition - and perhaps even its prevention and treatment.

Autism affects at least one child in every 2 500, mainly boys. Half of these never learn to speak and three-quarters have mental handicaps, though a small minority may show an exceptional talent for drawing, music or mental arithmetic. Although doctors now have a somewhat better understanding of how such individuals might perceive the outside world, they have yet to identify clearly the precise underlying brain dysfunction. "We are still only able to observe the development of the brain or study its functioning in a relatively unsophisticated way, particularly in young children, which is when autism first shows itself," explains Anthony Bailey of the Institute of Psychiatry in London.

Clues from twins

For several years now, researchers have adopted a genetic and molecular approach to try to improve their understanding of the origins of this disease. Studies carried out on families of autistic people have revealed certain predisposing factors. In monozygotic twins (genetically identical and coming from a single fertilised egg), if one child is affected, then in some 60% of cases the other one is too. In dizygotic twins (genetically non-identical, from two different eggs), this only occurs in about 4% of cases, indicating the importance of genetic influences. Studies of families with twins suggest that these influences might also extend to Asperger's syndrome and related disorders.

These studies led specialists to search for the few genes that they suspected must underlie the development of autism. The question was: how many and which ones? In 1995, in an attempt to identify the culprits, understand the origins of the disease and - ultimately - develop a treatment, an international consortium was set up to carry out a study of the molecular genetics of autism. Coordinated by researchers at the Institute of Psychiatry in London, it has received EU funding since 1997.[1] "About 200 families is generally considered to be the minimum sample for a study of this kind. This is far too many for any one country, " explains Dr Bailey. As virtually no individuals with autism have descendants, the genetic study has to focus on the relatively small number of families containing two individuals with autism or a related disorder. Hence the need for an international approach, and a consortium consisting of British, Dutch, German, French, Danish, Greek and American clinicians and researchers.

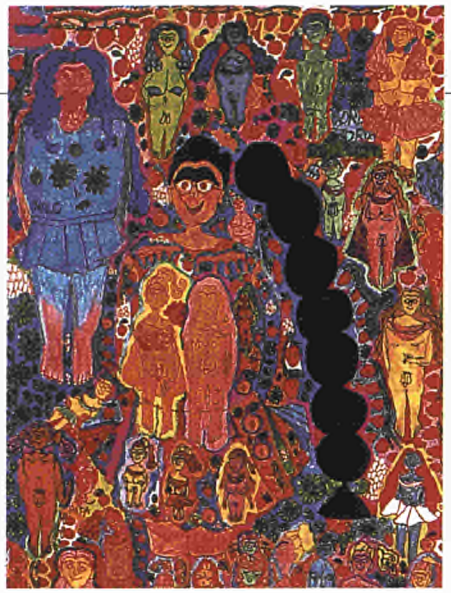
Drawings by Lisa Perini shown at the international exhibition, 'Creation from Silence' (Burgos - E), organised by the Association of Parents of Autistic Children, where she won first prize.

More precise diagnoses

Once the families had been identified and autism diagnosed, a blood sample was taken from each individual. Some of each sample was used to extract the DNA and to carry out the first molecular genetics studies in the laboratory of Professor Anthony Monaco at The Wellcome Trust Centre for Human Genetics in Oxford. The remainder was used to establish permanent cultures of cell lines. Kept in a cell bank, these cultures enable all the research teams to work on the same subjects. They also make it possible to carry out any additional analyses which may prove necessary.

The first stage, before the molecular biologists are brought in, is aimed at establishing a precise diagnosis and excluding subjects in whom autism is associated with a recognisable medical disorder that might distort the results. It is important to reliably quantify clinical heterogeneity in autism in order to be able to establish a link between the variability of the illness and the precise genes involved.

The project partners concentrated much of their efforts on this strategic aspect of selecting their subjects. They met regularly for working seminars on the use and reliability of their diagnostic tools and for in-depth discussions on problematic cases, based in particular on video recordings made during assessments of some patients.



Six suspect chromosomes

In 1998 - well ahead of schedule - this concerted effort to achieve precise diagnoses enabled the consortium to publish the first genetic study of autism ever carried out on a full genome.[2] This was based on 99 families, including 87 pairs of siblings and 12 families with more distant relationships (cousins, etc.).

The analysis of more than 300 genetic markers distributed at regular intervals across the full genome (and corresponding to regions which are in principle very variable from one individual to another), revealed six chromosomes (4, 7, 10, 16, 19 and 22) on which certain sites showed greater similarities among pairs of autistic individuals than would normally be expected. Two particularly significant regions were located on chromosomes 7 and 16. The region identified on chromosome 7 currently looks the most promising, as it shows the greatest similarities and also contains a number of genes involved in brain development and function.

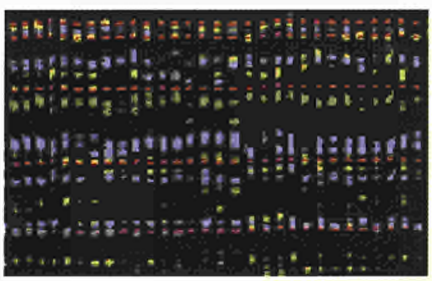
Living in hope

To date, more than 130 families have been recruited for the purposes of this study. The researchers are concentrating their genetic analyses on the first regions identified as those being potentially linked to the development of autism. These links must be confirmed by other groups and the target areas refined to identify the gene(s) involved in each region. "The identification of these various susceptibility genes is just the first stage in understanding the development of the disease," concludes Dr Bailey. "This approach does, however, hold out the hope that we can begin to give a meaning to a whole set of biological data, with the prospect that this work will lead to the development of preventative approaches or specific treatments. This research also raises the possibility of identifying any non-genetic factors which, in the case of a subject prone to autism, may lead to either a moderate or severe form of the disease. Although we still have a long way to go before we achieve our goal, it does seem closer now than it has ever been." ■

Enigmatic autism

First described by the American Leo Kanner in 1943, autism is a disorder which affects an individual's complete mental development. The symptoms (lack of social interaction, communication and imagination; limited interests and activities, etc.) vary greatly with age. The only treatment is early specialised education aimed at making the environment more accessible to the autistic child who may then possibly acquire language, social skills, learning ability and a knowledge of the world. Autistic adults, on the other hand, usually have to live in an adapted medico-social environment unless they can be cared for by their family.

• *To find out more about autism: Uta Frith, Autism: Explaining the Enigma, Basil Blackwell, Oxford, 1989.*



This computer image of a gel shows the markers from several families with autism, each marker being labelled with a different fluorescent dye. The gel shows where the markers shared between individuals vary; this data will help to pinpoint the genes responsible.

(1) Through a concerted action (Molecular Genetic Study of Autism - BMH4-CT-97-2759) under the Biomed 2 programme.
(2) A full genome screen for autism with evidence for linkage to a region on chromosome 7q, International Molecular Genetic Study of Autism Consortium, Human Molecular Genetics, 1998, Vol 7, n°3, 571-578

Contacts **Anthony Bailey**
MRC Child Psychiatry Unit,
Institute of Psychiatry - London
Fax: +44-171-252-5107
anthony.bailey@iop.kcl.ac.uk
Philippe Jehenson - Research DG
Fax: +32-2-29 55365
philippe.jehenson@cec.eu.int

Breathing new life into run-down neighbourhoods

Glasgow, Malmö, Leiden, Duisburg, Nancy, Naples - six towns where local associations are battling to revitalise less-favoured areas, with employment as an essential but certainly not unique ingredient. These local development initiatives are analysed in the ELSES project, a new kind of assessment, involving researchers and field workers right from the start.

"Until the early 1990s, in most European countries local policy to combat social exclusion focused primarily on the most urgent needs, such as health, housing or subsistence. It is only recently that we have also seen economic projects aimed at tackling root causes. Public authorities are now beginning to support the development of new companies, individual employment initiatives and targeted training in these less-favoured urban areas," explains Sabine Weck, a researcher at the ILS research institute in Dortmund, which is coordinating the EU's ELSES project.[1]

Fieldworker-researcher partnership

How are these actions being implemented? On what basis should they be judged? How effective are they? Do they really meet the needs of those they are designed to help? Can some of them serve as models and thus be adopted in other situations? These are the questions being studied by the German, British, Swedish, Italian, French and Dutch partners within ELSES. Their aim is to analyse the different strategies of local socio-economic development in specific neighbourhoods located in "problem" urban areas. The method adopted is to base this work on close cooperation between researchers and fieldworkers.

"ELSES is unique in having involved the local players right from the outset, when developing the project. This is an innovative approach, and not only in Italy," explains Valeria Fascione, a researcher at the IDIS Foundation (Naples).[2] By drawing on their day-to-day experience these "associated partners" identified the questions to be analysed - and sometimes the way of posing them.

"Contacts with the theorists are vital for those working in the field, enabling them to take a little distance and form a broader view. During discussions with the researchers we were able to verify the validity of our methods and find alternatives to improve our practices," points out Ercan Idik of the German Duisburg-Marxloh association. "Our work with the university shed valuable new light on our project," confirms Russell Stevenson, an employee of Govan Initiative Ltd in Glasgow (Scotland). "We support 90 local businesses, with quite diverse activities. The researchers highlighted the performances of the youngest companies in terms of their growth potential. We will be taking this criterion into account." In Nancy, the involvement of "beneficiaries" at all stages of an integration project was also seen as a guarantee of success. This project helped set up training for a group of women working informally in the family aid sector, with a view to access to part-time employment with recognised employee status.

"Go!", an initiative to promote start-ups in North Rhine-Westphalia

© Entwicklungsgesellschaft Duisburg - Photo Günter Matczik

Too much red tape

In March 1999 - the half-way point for the project - an initial seminar was held in Naples giving the researchers and associations the chance to compare their experiences and the different contexts. In Germany, where the national public sector assumes the traditional role of the welfare state, local development initiatives are managed largely by politicians and officials, the local community not really having much say in defining priorities and deciding on measures. In the United Kingdom, where the welfare state was trimmed considerably during the Thatcher years, the already well-established role of local associations has grown. As an example, Govan Initiative employs 164 people and manages an annual budget of 6 million euros. In Italy, in the urban area of Pomigliano d'Arco (Naples) - the scene of development schemes under European, national and regional programmes - the local authority has a certain autonomy and

The six European towns where local development initiatives are being assessed by the partners in the ELSES project.

plays a particularly active role in initiatives focusing primarily on job creation.

But almost everywhere, bureaucratic red tape can put a damper on projects - if not on enthusiasm. "Managing a contract is such a complex and disheartening experience, takes so much time, and involves dealing with so many different authorities that associations give up on some projects, solely because of the red tape involved," notes Jean-Luc Dumas of the Associations Jeunes et Cité in the Laxou-Nancy (F) district.

Jobs, and much more

"Although the initiatives studied in these European countries differ in many respects - in terms of finance, policy and legislation - they all come up against the difficulty of making the vital connection between the world of business and the survival of populations in difficulty," believes David Chevalier, sociologist at the University of Nancy 2. This was why, at the Naples meeting, the partners decided to concentrate on three subjects: social integration through work (placements, training, etc.), the social economy (based on services generated by and for the community) and support for entrepreneurial initiatives (help with enterprise creation, financial advice and services, development of infrastructures permitting network activities). Although jobs are the common ingredient, the scope of all three is wider than jobs alone.

"We are used to measuring these actions in terms of concrete results, such as how many jobs they generate, without giving them the time they need to develop. The number of jobs created is bound to be low in a regional environment with rising unemployment among the unskilled and a stagnant overall employment situation," points out Sabine Weck. "But apart from this aspect, very-small-scale local regeneration actions serve to restore social links, create new networks, introduce factors which improve the quality of life and living conditions in a neighbourhood, and open up new opportunities for participating in social life. These are all very real elements, even if they cannot be measured in the same way. There is a need to go beyond one-dimensional strategies if we are to solve issues that are not at all one dimensional."

From decision-makers to beneficiaries

The ELSES partners held a second meeting in October last year in Glasgow. They presented the initial findings, on the basis of which the direction of future work ideas on the measures to be taken and ways to put these into practice will be suggested to the politicians. Always at the forefront, local partners will have a key role to play in disseminating the project's results. "They are often the pioneers of good practices and they help ensure these are included in local development policy," notes Sabine Weck. "This project will be a success if it manages to bridge the traditional divide between those who make policy, those who implement policy, and those who assess its results. Such a link will require close cooperation - and constant feedback - between these various parties."

The parties include the beneficiaries themselves. "In each country, it is essential to adopt an approach designed to include the most underprivileged groups in the decision-making process," concludes David Chevalier. "To my mind, this goes beyond the field of integration and strategies for local economic development. Above all, it is a question of local, regional, national, and even European democracy." ■

(1) Evaluation of Local Socio-Economic Strategies in Disadvantaged Urban Areas was launched in 1998, for a two-year period, under the Targeted Socio-Economic Research programme (Fourth Framework Programme).

(2) The IDIS Foundation (http://www.idis.unina.it/) is a non-profit organisation whose main aim is to produce socially relevant initiatives promoting scientific culture and technological innovation.

Contacts
Sabine Weck
Fax: +49-231-9051155
sabine.weck@ils.nrw.de
Fadila Boughanemi - Research DG
Fax: +32-2-2962137
fadila.boughanemi@cec.eu.int
www.ils.nrw.de/netz/elses/

Defence against the white fury

In 1999, a series of particularly ferocious avalanches in the Alps have served as a reminder of the often hazardous nature of the relationship between man and nature. In many respects a mountain will always remain "untamed", resisting man's attempts to domesticate it. Nevertheless, the SAME project is now revealing some of the secrets behind these avalanches, helping both to anticipate and avert the danger.

On 9 January 1999 the Alps saw massive snowfalls accompanied by high winds. Frequent and heavy snowfalls persisted through to late February, bringing in their wake one of the worst winters for avalanches the century has seen. The mountains took a heavy toll, leaving many victims and causing major material damage at sites in Austria (Galtür), Switzerland (Evolène) and France (Chamonix). The scale and frequency of the disasters resulted in many questions being asked of the local officials responsible for deciding land-use norms and granting planning permission, as well as the experts responsible for providing them with the objective criteria to apply when making their decisions.

Limited knowledge

What are the scientific facts on which these criteria are based? Certain disaster prevention measures used in the past - and still in force today - have shown their limitations. One example is the nivo-meteorological forecast, based on data obtained from nivology (the study of snow) and meteorology, which helps in planning evacuations. This system provides a risk index on a European scale of 1 to 5. At level 4 or 5 - depending on the region - the authorities give the order for populations considered to be at risk to be evacuated. But in the vast majority of cases these evacuations prove to be unnecessary and the number of false alarms shows just how inaccurate this kind of forecasting is.

Avalanche maps, which attempt to gather all the spatial and spatio-temporal data at a given site, are not much better. These historical data no doubt make it possible to identify risk areas (i.e. areas already hit by avalanches in the past), but they are of little value in forecasting terms, for example, in anticipating more disastrous scenarios or identifying where the next avalanches will occur.

Sounding out the mountain

The EU's SAME (Snow Avalanche Modelling and Mapping in Europe) project was set up with the aim of correcting these inadequacies.[1] It involved close international and interdisciplinary cooperation over a 30-month period between 14 partners from the EU, Norway, Switzerland and Iceland.

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Artificial avalanche triggered by explosives, carried out by the Serre-Chevalier (France) ski station patrol.

There were three main areas of inquiry: avalanche information systems; warning systems; modelling and sensor testing. "These areas of inquiry reflect the areas of expertise in the research teams," explains the project's coordinator, Gérard Brugnot, of the natural risks programme at Cemagref, a public agricultural and environmental research institute in Grenoble (F). "Some scientists place the emphasis on measurements in the field, others on models, and others on decision-support tools."

These approaches also reflect national differences. "That is no doubt to do with the fact that management of this kind of natural risk is closely linked to town and country planning, and decision support, and thus to a political perspective. Before the SAME project, everybody believed they had the right system. One of the merits of a European project is the way it enabled us to move away from these national approaches. The exchanges between researchers were very rewarding, each one recognising the value of the other's approach."

Data, language and models

The project's initial stage involved collecting extensive and very varied data on avalanches, including site maps, incident files, procedures, etc. Once gathered, they then had to be harmonised and classified. At this stage, terminology proved a major problem. This was overcome by creating a multilingual glossary of the terms used in modelling and describing avalanches, and recording all related indications. The researchers now have a "meta" information system ("information on the information available").

The SAME project also made progress in the field of modelling. Again, data had to be gathered and harmonised. All models are different and they each have their own area of interest. Historical data, for example, allow us to estimate the difference between actual and forecast damage. An inventory of about 50 models was produced, giving their characteristics and conditions of application. This allowed the researchers to construct a single computerised platform on the basis of which different avalanche models could be used in risk forecasting.

Some of these were the subject of full-

Simulation of the Mont Roc avalanche, which occurred in February 1999 in the Chamonix area.
(Calculation and image production: Mohamed Naaim.)

Natural powder snow avalanche following a snowfall in the Chamonix valley (France)

scale tests at five European sites (in France, Italy, Switzerland, Spain and Norway) with a well-documented avalanche history. "We can conclude that there is no miracle model. Each one of them reflects certain aspects of the true picture on the ground, which is why it was so interesting to be able to compare them. The researchers were able to identify the complementary elements - all of them elements to be taken into account in the future."

These artificially triggered avalanches also enabled better measurement and understanding of the internal dynamics of snow movements, and a number of instruments, such as detectors, radars and various sensor types, were tested at these special sites. For this, a series of parameters were precisely analysed and tests carried out on the effectiveness of systems for warning the individuals concerned (local authorities, local population, car and train drivers, etc.) of imminent danger.

Where? When? Whose fault?

The scale of devastation in the Alps, coupled with media coverage, generated many questions, accusations and legal proceedings. Local planning officials were often accused of being too intent on encouraging the development of tourism; scientists and experts of offering the wrong advice and failing to anticipate the dangers; and technicians of not being conscientious enough in their work. "It's a complex question, with conflicting interests. Interdisciplinary working parties could be set up in order to draft standards based on solid scientific content, from which, for example, the precise responsibilities of individuals in charge of risk zoning could be defined. But our work will always be fraught with the problems of spatial and temporal precision. Exactly Where? and When? The accidents during the winter of 1999 were, in a way, expected. But averting them would have required much more precise forecasting, and that is something we are not yet able to do. In order to progress, we need a better knowledge of the mechanisms that govern the building up of the snow - wind and precipitation - instability within the snow cover, and the flow of avalanches. The models constructed on the basis of this knowledge could then be checked both by means of experiments carried out under controlled conditions, and also on the basis of early field data provided by historians." ■

(1) This project, supported by the Environment and Climate programme (Fourth Framework Programme) ended in November 1998. A summary of its results and a CD-ROM (Avalanches: mapping, model validation and warning system - EUR 19069) are being prepared for publication (contact: denis.peter@cec.eu.int).

Contacts
Gérard Brugnot
Cemagref Grenoble
Fax: +33-4-76762711
gerard.brugnot@grenoble.cemagref.fr
Denis Peter - DGXII
Fax: +32-2-2963024
denis.peter@cec.eu.int
www.cemagref.fr/English/sv/sv06iv.htm

CG-23-99-002-EN-C

Microsurgery in Assisi

Shaken to the core by the 1997 earthquakes, the Basilica of St Francis is now on the road to recovery. A European technological innovation based on 'shape memory' alloys is one of the seismic-protection systems which will help it withstand any future disasters of this kind.

September 1997: five earthquakes shook the Italian regions of Umbria and Marche. Some 20 kilometres from the epicentre, the Basilica of St Francis of Assisi was one of the victims. Clouds of dust invaded the nave, whole sections of the frescoes by Giotto and Cimabue were reduced to rubble, and a gaping hole, like a pool of light, appeared where the tympanum had once been. More than a million tourists and pilgrims visit the site annually, with even more expected for the year 2000.

Shape memory alloys

September 1998: the Italian Ministry of Culture and the European Commission organised a three-day meeting, an opportunity for European experts in the field of research for the protection and restoration of cultural heritage to come together for an exchange of views. Among the research projects presented , Istech[1] proposed a technology based on a nickel and titanium alloy belonging to the SMA, or shape memory alloy, family.

"The principal benefit of this material is its ability to disperse the energy produced by movement. For example, it can dissipate some of the shock waves coming up from the ground during an earthquake," explains Giorgio Croci, a professor at "La Sapienza" University (Rome), who is in charge of the restoration work in Assisi. "Our SMA devices offer the advantage of being calibrated for a specific level of seismic activity up to which they behave according to their unique characteristics. Above this design level, they provide the required rigidity using traditional steel bars. This double guarantee makes them very reliable," confirms the project's scientific coordinator, Maria Gabriella Castellano of FIP Industriale.[2]

Supporting tests

September 1999: the scars at the Basilica are beginning to heal. "We chose different restoration methods depending on the architectural elements to be repaired and the damage incurred," points out Giorgio Croci. "For the tympanum, and its connection with the roof, we opted for the SMA system, whose properties are particularly suited to this part of the basilica, which was badly damaged and quite fragile."

Before being chosen for Assisi, this innovative technology had to prove its worth. Tests were carried out in the ELSA laboratory at the Joint Research Centre in Ispra (I). Simulations on life-size masonry walls showed that, at the same seismic intensity, non-reinforced walls are seriously damaged or collapse, while walls fitted with the SMA systems suffer no damage at all. Digital analyses and additional tests carried out by ENEA (Bologna) showed that structures protected in this way increase their resistance to earthquakes by at least 50%. Finally, before starting work on the basilica's tympanum, the restorers installed four SMA devices in the tower of the San Giorgio de San Martino church in Rio, a victim of another earthquake. ■

Preparing the installation of the SMA devices.

Seismic protection using shape memory alloys (SMAs): a world 'first' applied to the Assisi tympanum.

(1) Istech (Development of Innovative Techniques for the Improvement of Stability of Cultural Heritage, in particular Seismic Protection), was supported by the Environment and Climate programme (Fourth Framework Programme), and brings together six partners: FIP Industriale (I), ENEA - Ente per le Nuove Tecnologie, l'Energia e l'Ambiente (I), Università degli Studi di Roma "La Sapienza" (I), Aristotle University - Thessaloniki (GR), Instituto Superior Tecnico - Lisbon (PT), ELSA - European Laboratory for Structural Assessment - JRC (I).

(2) FIP is also at the origin of two other types of seismic protection device, developed under the REEDS project (Brite-EuRam programme), one of which is also being installed in St Francis' Basilica in Assisi.

Contacts **Maria Gabriella Castellano**
FIP Industriale
Fax: +39-049-638567
castellano.fip@fip-group.it
Julia Acevedo - Research DG
Fax: +32-2-29-60324
julia.acevedo-bueno@cec.eu.int